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CALIFORNIA DEPARTMENT OF FISH AND GAME
HABITAT CONSERVATION DIVISION
Native Anadromous Fish and Watershed Branch
Stream Evaluation Program

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CENTRAL VALLEY ANADROMOUS FISH-HABITAT
EVALUATIONS
October 1999 through September 2000

Annual Progress Report
Prepared for
U.S. Fish and Wildlife Service
Central Valley Anadromous Fish Restoration Program

Habitat Conservation Division
Stream Evaluation Program Technical Report No. 01-3
December 2001

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1/ Funded by the U.S. Fish and Wildlife Service pursuant to the CENTRAL VALLEY PROJECT IMPROVEMENT ACT to improve anadromous fish habitat in California's Central Valley streams.

2/ Stream Evaluation Program Technical Report No. 01-3.

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EXECUTIVE SUMMARY

The Department of Fish and Game is conducting various investigations in Central Valley streams to acquire information on anadromous salmonid populations. Results of the investigations will be used to identify flow requirements for Central Valley anadromous salmonid populations. The work is being conducted pursuant to a cooperative agreement with the U.S. Fish and Wildlife Service to satisfy requirements of the Central Valley Project Improvement Act, Section 3406(b)(1)(B).

The investigations have been ongoing since fall 1995 and have included the Sacramento, Yuba, American, Cosumnes, Calaveras, Stanislaus, Tuolumne, and Merced rivers. Data acquired on these streams varies from typing and mapping habitats using aerial photography to comprehensive evaluations and monitoring of spawner populations, spawning distribution, spawning habitat conditions, juvenile rearing, juvenile migration, and juvenile habitat conditions. The comprehensive evaluations have been primarily focused on the reaches of the Sacramento and American rivers that are influenced by Central Valley Project operations.

To date, results of the investigations on the American River have provided for improved understanding of flow and other habitat requirements of salmon and steelhead. The American River data are continually being used by water management and fishery management agencies to identify optimum allocation of flow required for conserving and restoring salmon and steelhead populations in the lower American River. The data collected on the lower American River are the primary source of data included in the Lower American River baseline report prepared by the Lower American River Fish Work Group. The baseline report provided the foundation for development of a Fishery Restoration Plan that includes flow, temperature and other habitat management and restoration actions to improve conditions for salmon and steelhead in the lower American River. The lower American River data are also providing a preponderance of the data on salmon and steelhead flow requirements in a process sponsored by the City of Sacramento, the County of Sacramento and the American River Water Forum in the development of a "flow standard" for the lower American River. Fishery, water and flood management agencies in cooperation with various special interest organizations, are using these data to identify the most appropriate means to establish flow standards that would protect salmon and steelhead and provide secure water supplies on the lower American River. A comprehensive report summarizing the information supporting a new flow standard, including the application of data developed by the Department of Fish and Game per the work supported by the CVPIA, is forthcoming.

Data collected pursuant to the CVPIA-funded work are also being used to identify status and needs of salmon and steelhead globally as they relate to basin-wide management of water and other habitat needs. The National Marine Fisheries Service (NMFS) has and continues to use data collected on winter-run chinook salmon and steelhead to identify conservation management actions on a real-time basis. Information collected on steelhead is some of the most recent available for the Central Valley and was used by the NMFS in their deliberation of listing

steelhead as threatened in the Central Valley evolutionary significant unit (ESU). This information is presently being used to help identify critical habitat for steelhead in the Central Valley ESU, and in the deliberation of the listing of spring-run, fall-run and late-fall run chinook salmon in the Central Valley ESU.

Data collected to date on the American and Sacramento rivers are also being used to refine methods used to identify habitat needs, including flow, on these rivers and on other stream systems within the Central Valley. A primary objective of these investigations is to develop and validate scientifically credible methods for determining habitat requirements for all life stages of salmon and steelhead that depend upon Central Valley streams.

During the period summarized in this report (October 1999 through September 2000), the majority of work was conducted in the Sacramento River. Spawner surveys were conducted on all four races of salmon: juvenile rearing and emigration monitoring was conducted on salmon and steelhead. Surveys were also conducted on fall-run chinook salmon spawning habitat distribution and use requirements in lower Butte Creek (Butte County).

INTRODUCTION

In July 1995, the California Department of Fish and Game (DFG) entered an agreement with the U.S. Fish and Wildlife Service (FWS) to evaluate anadromous salmonid habitat requirements in Central Valley streams. Various studies have been developed and are being carried out by the Stream Evaluation Program to provide the FWS Central Valley Anadromous Fish Restoration Program with reliable scientific information. The information is to be used by DFG and FWS to develop flow recommendations to satisfy requirements of the Central Valley Project Improvement Act, Section 3406(b)(1)(B).

The basic approach to the evaluations is outlined in *Proposal to define instream flow and habitat requirements for anadromous resources in Central Valley Streams, September 1994*. The approach includes developing a better understanding of the life history of chinook salmon and steelhead trout emphasizing the relationships between life stage requirements and manageable habitat attributes (e.g., flow, water temperature, channel conditions, etc.). Initially, the evaluations concentrated on the Sacramento and American rivers. Continued investigations will include individual evaluations of spawning, rearing, and migration on these and other Central Valley streams.

One requirement of the agreement is to provide the FWS with annual progress reports. This report covers the investigations conducted in the Sacramento River during the period October 1999 through the last week of September 2000. During that period, DFG conducted seven general investigations (Table 1).

Table 1. Investigations conducted by the Department of Fish and Game to determine anadromous salmonid habitat requirements in Central Valley streams, October 1999–September 2000.

Investigation	Sacramento River	Butte Creek
Habitat mapping	Completed	Initiated
Fall-run chinook salmon spawning	X	Initiated
Late fall-run chinook salmon spawning	X	NA
Winter-run chinook salmon spawning	X	NA
Spring-run chinook salmon spawning	X	NA
Juvenile salmonid rearing	X	NA
Juvenile salmonid emigration	X	NA

Reports on the results of the fall-run and late-fall run chinook salmon spawning evaluations conducted on the Sacramento River during the reporting period are presented as Appendices III and IV.

UPPER SACRAMENTO RIVER REARING HABITAT EVALUATION

Rearing habitat investigations are intended to determine temporal and spatial distributions of the various juvenile life stages of anadromous salmonids in the upper Sacramento River. These investigations compliment juvenile emigration evaluations and should be conducted year around to understand behavior of juvenile salmonids fully concerning habitat conditions. Some of the information to be gained from our studies includes: relative importance of upper river habitats to different life stages under varying conditions; temporal and physical significance of various habitat conditions; and significance of stream conditions downstream of the study area - an overall understanding of the relationship between fish and habitat in the upper river as it is influenced by potentially manageable biotic and abiotic, habitat attributes.

Evaluation of anadromous salmonid rearing habitats in the upper Sacramento River using seine and snorkel surveys was initiated in August 1996. The study area was located between river mile 271 (just below the mouth of Battle Creek) and river mile 302 (Keswick Dam) (Fig. 1). Most sites sampled were located above Battle Creek, hence upstream of the influence of Coleman National Fish Hatchery. Sample sites were selected from 143 habitat units located in the study area; these units had been previously mapped by the Department (Appendix I). Habitat mapping was based on channel morphology using a stratified classification system similar to that used on the American River. Habitat types (e.g., pool, riffle, run, and glide) were stratified by habitat zone (flatwater, bar complex, side channel, and off channel). Our goal was to sample twice per month 3 replicates of 11 randomly selected habitats. For this report, all the data from habitats distinguished by zone (i.e., flatwater pool and bar complex pool) were combined to represent 5, instead of 11 habitats: riffle, pool, glide, run, and off-channel. During the snorkel survey, two swimmers would survey a 150-ft long section randomly selected along each bank of the habitat unit. Data collected included: species, size in 25-mm size classes, and general habitat attributes (mean depth, mean velocity, cover, etc.). During the seining surveys, habitat units were sampled with a 50 x 4-ft beach seine. Up to two seine hauls were made per unit. Data collected included number of salmonids (by species); size of up to 50 salmon and trout, per haul, (i.e., fork length [FL] to the nearest 0.5 mm, and weight, to the nearest 0.1 g); and general habitat attributes of the site seined.

Snorkel Survey Results

Chinook Salmon

A total of 63,331 juvenile chinook salmon was counted during the snorkel survey (Table 2). The mean weekly number of salmon counted per sample site ranged from 0 (week 43) to 1,219 (week 21).

UPPER SACRAMENTO RIVER EMIGRATION SURVEY

Emigrating juvenile salmonids were monitored at a trap site upstream of the Balls Ferry Bridge (RM 278). The purpose of the monitoring is to determine the timing and relative abundance of salmon and steelhead trout (possibly resident rainbow trout) emigration compared with precedent conditions of spawning and rearing in the upper natal stream. The results provided in this report are from October 1999 (week 41 of 1999) through September 2000 (week 18 of 2001). Sampling was conducted with one to two rotary screw traps. Sampling was conducted for most of the year.

Our rotary screw trap sampling efforts were greatly reduced during some weeks in October and November 1999 and in September–November of 2000 to avoid exceeding the Section 10 take limit. Sampling was conducted throughout most of the remainder of the survey period except during occasional short periods when the traps had to be repaired.

Data recorded when the screw traps were checked included number of hours fished and juvenile salmonids collected by species. Race for chinook salmon was determined using the length-at-time criteria developed by Frank Fisher (Department of Fish and Game - Red Bluff). Up to 150 fish per trap were measured and weighted (FL in mm and weight in g) each time the trap was checked. Normally it was checked twice per day. We attempted to make sure that all runs were included in the sample. All juvenile steelhead trout were counted and measured.

Trap efficiency was evaluated by marking a portion of salmon captured (winter run were never marked). Fish were marked with dyes either by injecting them with Alcian blue or, rarely, by bathing them in Bismark brown. Fish captured and marked at Balls Ferry were transported upstream about 2,500 feet then released. All salmon captured in the Balls Ferry traps were checked for marks as they were measured.

Emigration Results

Chinook Salmon

Juvenile salmon were collected every week sampled (Table 8; Fig. 37). Catch rates ranged from 0.84 fish/h (week 49 of 1999) to 189 fish/h (week 37 of 2000). The highest catch-per-hour rates were observed during weeks 37 and 38 during the peak of winter-run emigration (Fig. 38). Mean weekly size ranged from 37.0 mm FL (week 4) to 72.7 mm FL (week 25). Recently emerged-sized fish (≤ 35 mm FL) were captured every week except week 8. Larger smolt-sized fish (≥ 70 mm FL) were collected every week except week 4 (2000).

A total of 82,229 chinook salmon was counted. Of this total, there were 5,089 spring-run sized salmon; 53,177 fall-run sized salmon; 2,619 late-fall-run sized salmon; and 21,344 winter-run sized salmon (448 were brood year [BY] 1999 and 20,896 were BY 2000). Spring run peaked in weeks 51–2 (Fig. 39). Fall-run emigration peaked during weeks 1 and 2. Late-fall salmon catch peaked during weeks 18–20. Winter-run from BY 1999 were emigrating when the reporting

period started on 1 October 1999. Winter run from BY 2000 started to peak in week 37.

Spring-run salmon ranged from 33 to 125 mm FL (Fig. 40). Fall run ranged from 25 to 115 mm FL; late-fall run ranged from 32 to 146 mm FL; and winter run ranged from 31 to 165 mm FL.

Trapping efficiency, as measured by the recovery of dye-marked fish, showed that efficiency ranged from 0.00% (week 4) to 2.51% (week 20) with a yearly mean of 0.92% (Table 9).

Steelhead Trout

Steelhead trout were collected throughout the entire survey period except for weeks during January, February, and September (Table 10; Fig. 41). Mean week size ranged from 37.6 mm FL (week 30) to 318.0 mm FL (week 2). Weekly catches ranged from 0 (weeks 3, 4, 8, 9, 10, and 37) to 59 (week 17). Weekly catch/hour rates ranged from 0.00 fish/h to 0.35 fish/h (week 19) (Fig. 40). Steelhead trout ranged from 23 to 700 mm FL for the survey. A total of 623 steelhead trout was captured.

Table 8. Summary of chinook salmon catch statistics, upper Sacramento River emigration survey using rotary screw traps located upstream of Balls Ferry bridge (river mile 278), October 1999–September 2000.

Week	Start date	Weekly catch	Catch/h	Size statistics			
				Mean	Minimum	Maximum	SD
No sampling from weeks 40 through 48 to avoid exceeding winter-run take limit and week 5							
49 (1999)	Nov 28	80	0.84	60.5	31	119	26.7
50	Dec 5	512	3.11	44.2	27	131	20.0
51	Dec 12	1,577	9.36	46.5	30	135	20.0
52	Dec 19	4,804	33.32	42.3	32	146	15.9
1 (2000)	Dec 26	10,040	82.63	40.6	32	119	13.1
2	Jan 2	9,670	67.27	40.1	34	337	17.9
3	Jan 9	3,650	30.23	37.7	33	71	3.0
4	Jan 16	558	11.75	37.0	34	43	1.3
5	Jan 23	No sampling due to trap repair					
6	Jan 30	1,796	18.66	40.1	33	113	5.1
7	Feb 6	6,620	39.46	38.3	32	128	4.0
8	Feb 13	12	0.42	42.4	36	91	14.7
9	Feb 20	168	3.04	38.5	26	56	2.9
10	Feb 27	333	3.33	38.1	25	377	20.3
11	Mar 5	54	1.03	38.9	35	69	5.8
12	Mar 12	2,243	13.39	43.9	33	123	9.6
13	Mar 19	2,293	13.69	48.4	32	155	14.7
14	Mar 26	1,650	9.88	46.3	31	121	14.3
15	Apr 2	621	3.70	47.3	33	135	17.1
16	Apr 9	903	5.15	54.8	33	111	19.0
17	Apr 16	1,547	9.21	65.0	33	118	16.3
18	Apr 23	1,709	10.13	57.2	32	101	18.1
19	Apr 30	1,024	6.10	60.2	33	165	18.5
20	May 7	1,206	7.18	70.0	32	102	14.9
21	May 14	1,980	11.80	70.6	33	125	13.0
22	May 21	1,511	8.95	65.0	34	108	14.0
23	May 28	599	5.93	69.5	34	111	12.2
24	Jun 4	710	4.22	71.4	32	125	13.1

Table 8. (cont.).

Week	Start date	Weekly catch	Catch/h	Size statistics			
				Mean	Minimum	Maximum	SD
25	Jun 11	963	6.17	72.7	35	107	12.2
26	Jun 18	591	3.52	68.4	34	98	14.7
27	Jun 25	358	2.14	66.1	32	96	16.2
28	Jul 2	264	2.21	66.9	31	107	15.3
29	Jul 9	247	1.91	64.7	30	100	17.9
30	Jul 16	445	2.84	61.1	32	101	18.0
31	Jul 23	457	2.71	57.4	32	100	19.6
32	Jul 30	317	6.34	45.4	34	105	17.1
33	Aug 6	268	11.17	37.1	33	99	9.0
34	Aug 13	1,265	26.35	40.8	31	101	13.8
35	Aug 20	2,295	95.62	56.0	31	110	22.3
36	Aug 27	3,642	182.10	56.4	31	108	25.6
37	Sept 3	4,555	189.79	41.4	31	115	18.2
38	Sept 10	5,625	117.19	47.0	33	106	21.8
39	Sept 17	1,529	63.71	43.4	34	96	17.1
40	Sept 24	1,538	64.08	42.7	34	110	17.4
Total		82,229	16.15	53.9	25	377	19.4

Table 9. Summary of capture efficiency weekly results for chinook salmon collected by rotary screw trap upstream of Balls Ferry Bridge (RM 278) during the upper Sacramento River emigration survey, October 199–September 2000.

Week	Number marked	Number recaptured	Efficiency (%)
51	999	4	0.40
52	2,527	33	1.30
1	1,152	9	0.78
2	3,426	31	1.49
3	1,517	11	0.72
4	539	0	0.00
5	0	0	-
6	1,640	5	0.30
7	2,883	20	0.69
8	-	-	-
9	-	-	-
10	-	-	-
11	-	-	-
12	1,421	7	0.49
13	2,069	12	0.60
14	1,451	11	0.76
15	532	4	0.75
16	597	6	1.00
17	1,359	14	1.03
18	1,518	29	1.91
19	712	10	1.40
20	1,114	28	2.51
21	1,809	19	1.05

Table 9. (cont.)

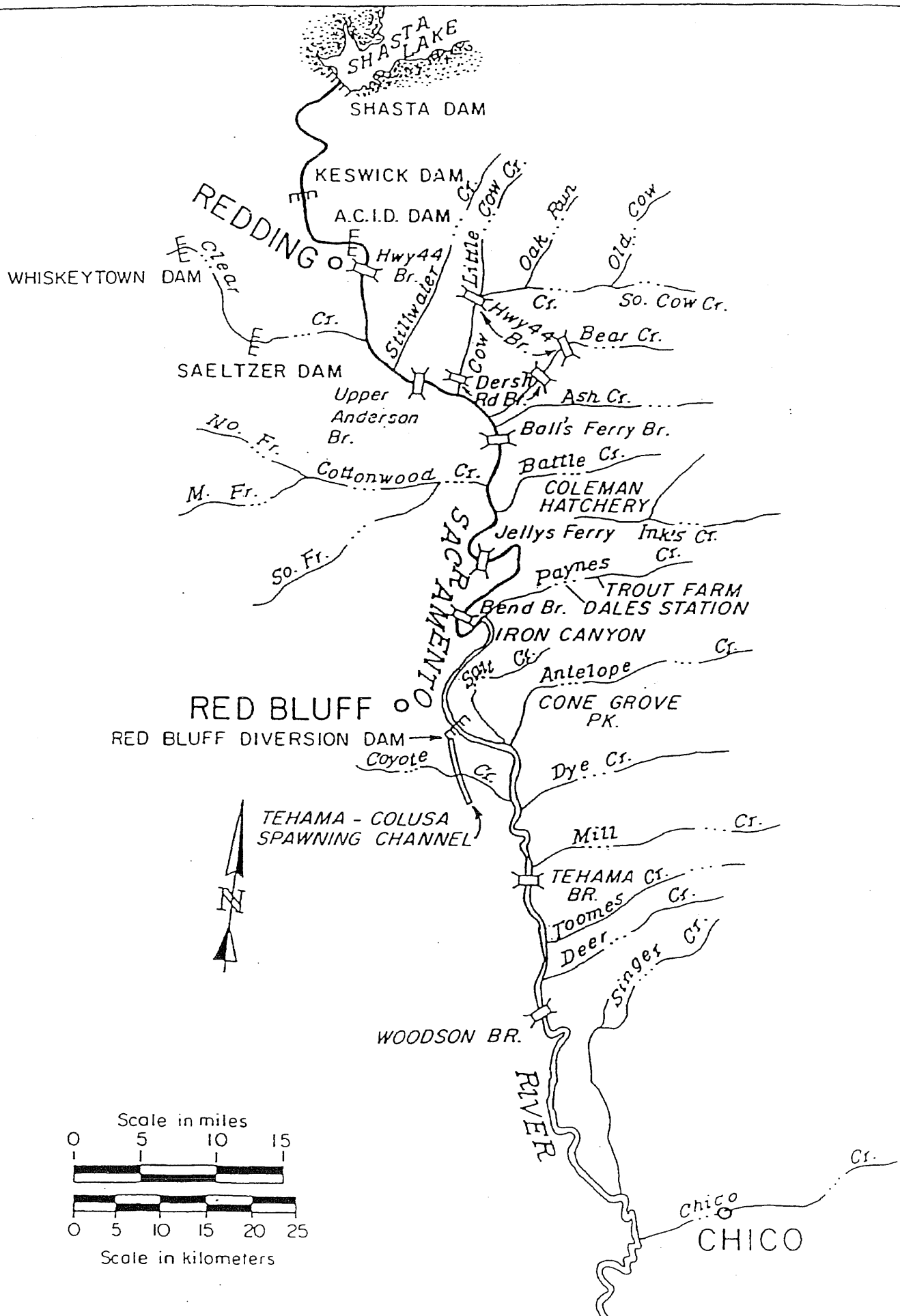
Week	Number marked	Number recaptured	Efficiency (%_
22	1,135	9	0.79
23	554	2	0.36
24	659	3	0.46
25	905	2	0.22
26	570	1	0.18
27	316	4	1.27
28	188	1	0.53
29	288	0	-
30	237	3	1.27
31	226	1	0.44
Total	32,343	299	0.92

Table 10. Summary of steelhead trout catch statistics, upper Sacramento River emigration survey using rotary screw traps located upstream of Balls Ferry bridge (river mile 278), October 1999–September 2000.

Week	Start date	Weekly catch	Catch/h	Size statistics			
				Mean	Minimum	Maximum	SD
No sampling from weeks 40 through 48 to avoid exceeding winter-run take limit and week 5							
49	Nov 28	3	0.03	73.3	56	87	12.9
50	Dec 5	5	0.03	86.4	58	115	20.2
51	Dec 12	2	0.01	83.0	82	84	1.0
52	Dec 19	8	0.06	69.5	52	93	15.6
1	Dec 26	4	0.03	179.8	57	500	185.2
2	Jan 2	4	0.03	318.0	62	500	182.1
3	Jan 9	0	-	-	-	-	-
4	Jan 16	0	-	-	-	-	-
5	Jan 23	-	-	-	-	-	-
6	Jan 30	1	0.06	70.0	70	70	-
7	Feb 6	2	0.01	86.5	78	95	8.5
8	Feb 13	0	-	-	-	-	-
9	Feb 20	0	-	-	-	-	-
10	Feb 27	0	-	-	-	-	-
11	Mar 5	1	0.02	26	26	26	-
12	Mar 12	8	0.05	70.6	27	200	54.3
13	Mar 19	17	0.10	98.6	68	192	30.0
14	Mar 26	16	0.10	88.2	38	122	18.4
15	Apr 2	14	0.08	96.9	33	390	82.0
16	Apr 9	21	0.12	83.0	36	350	63.0
17	Apr 16	59	0.35	67.0	35	155	17.3
18	Apr 23	23	0.14	62.0	43	95	12.7
19	Apr 30	11	0.07	58.6	45	114	19.2
20	May 7	31	0.18	60.4	44	98	11.6
21	May 14	50	0.30	68.7	46	230	25.5
22	May 21	48	0.28	77.8	27	700	91.7
23	May 28	8	0.08	60.1	30	79	17.2
24	Jun 4	14	0.08	93.9	26	50	114.2

Table 10. (cont.).

Week	Start date	Weekly catch	Catch/h	Size statistics			
				Mean	Minimum	Maximum	SD
25	Jun 11	14	0.09	66.6	28	92	92
26	Jun 18	11	0.07	62.6	29	175	39.4
27	Jun 25	17	0.10	55.0	28	140	30.3
28	Jul 2	14	0.12	38.1	35	80	14.3
29	Jul 9	15	0.12	44.1	25	101	20.1
30	Jul 16	11	0.07	37.6	25	57	10.9
31	Jul 23	34	0.20	41.6	23	91	16.2
32	Jul 30	14	0.28	52.8	35	92	16.1
33	Aug 6	20	0.83	56.6	42	90	12.9
34	Aug 13	54	1.11	57.0	35	114	13.5
35	Aug 20	13	0.54	56.2	42	73	9.2
36	Aug 27	34	1.70	57.4	38	140	20.5
37	Sept 3	0	-	-	-	-	-
38	Sept 10	14	0.29	62.4	46	88	11.0
39	Sept 17	3	0.12	55.7	45	64	7.9
40 (2000)	Sept 24	5	0.21	56.6	52	68	5.8
Total		623	0.12	67.0	23	700	51.9



Effort and catch rate for chinook salmon caught during the upper Sacramento River emigration survey, 1999-2000

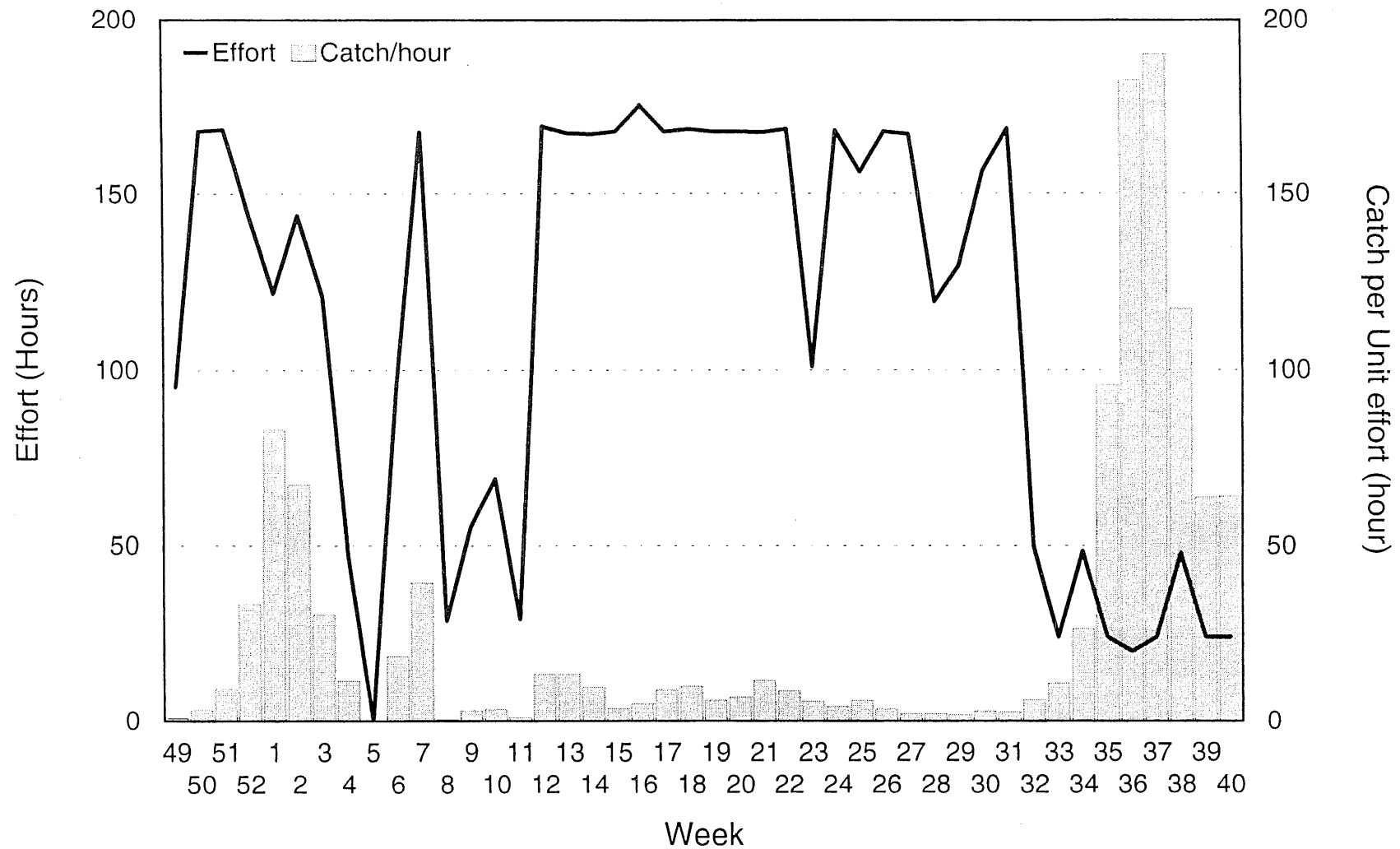


Figure 37. Weekly catch rate (catch/h) of chinook salmon and hours fished by rotary screw trap in the upper Sacramento River, October 1999 - September 2000.

Size statistics and weekly catch of chinook salmon caught during the upper Sacramento River emigration survey, 1999-2000

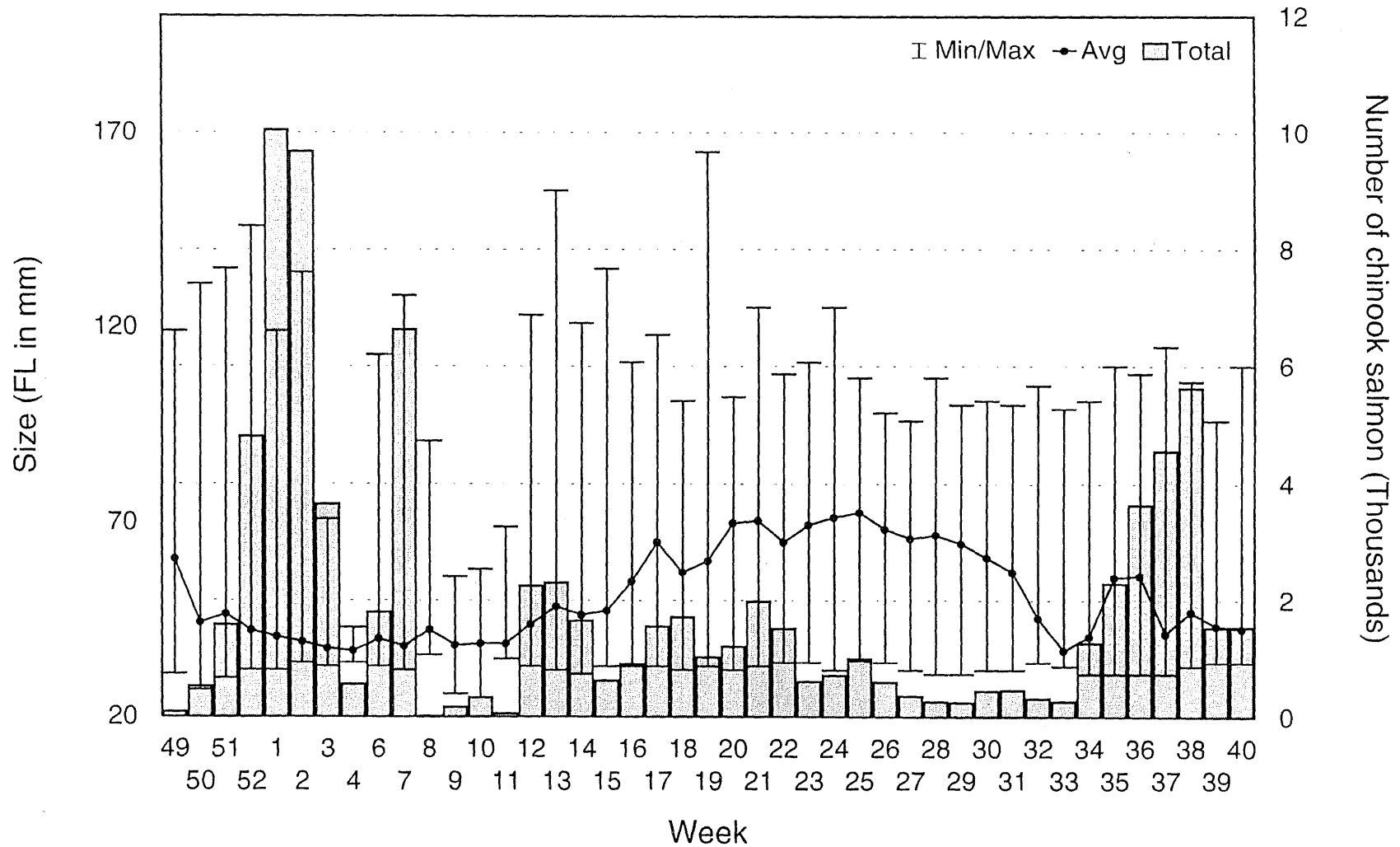


Figure 38. Total number of chinook salmon caught and the mean forklength (minimum and maximum) on a weekly basis in the upper Sacramento River, October 1999 - September 2000.

Chinook salmon catch distribution by race Upper Sacramento River emigration survey, 1999 - 2000

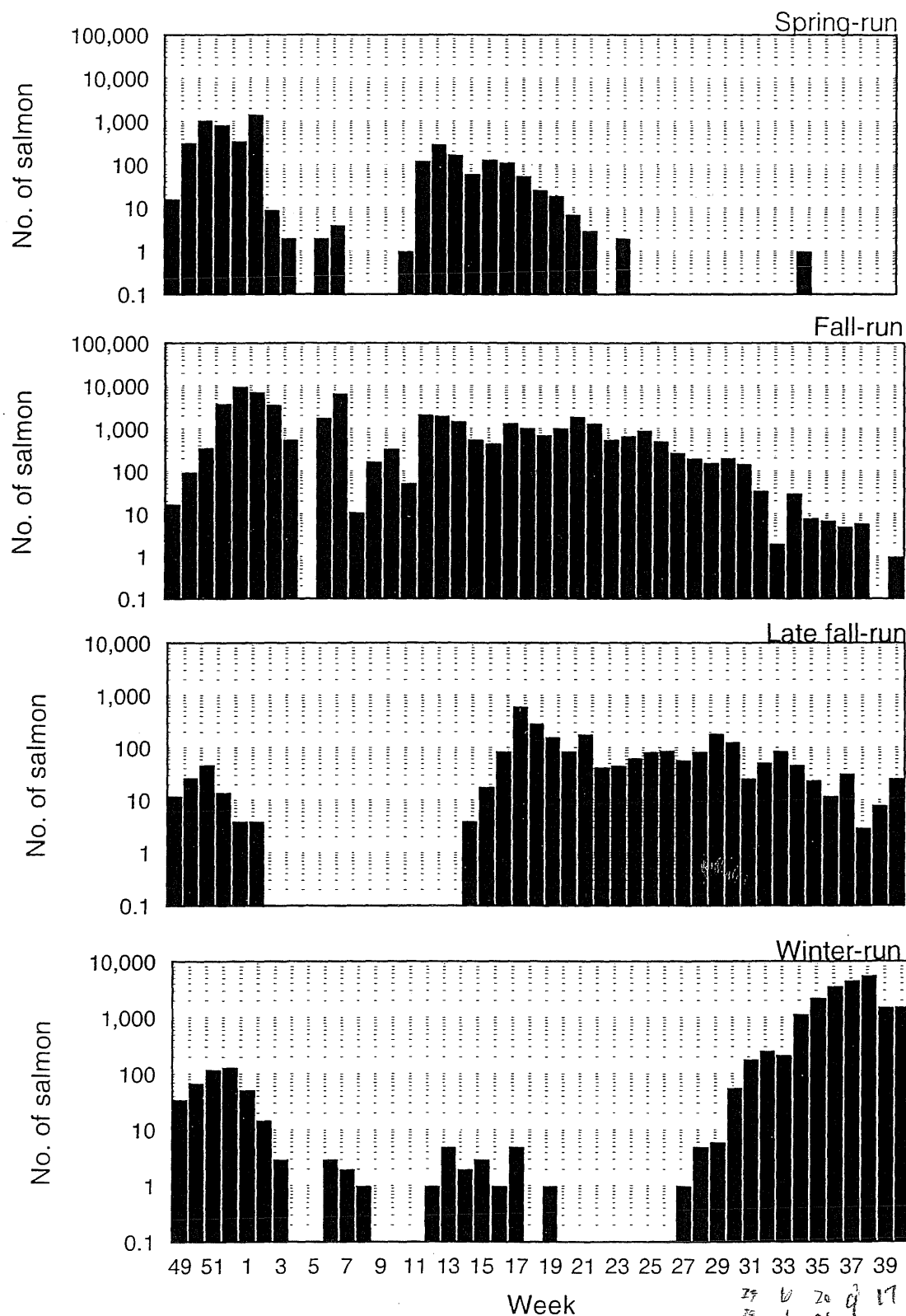


Figure 39. Catch distribution of chinook salmon races collected by rotary screw trap in the upper Sacramento River, 28 November, 1999 - 30 September 2000.

Chinook salmon size distribution by race Upper Sacramento River emigration survey

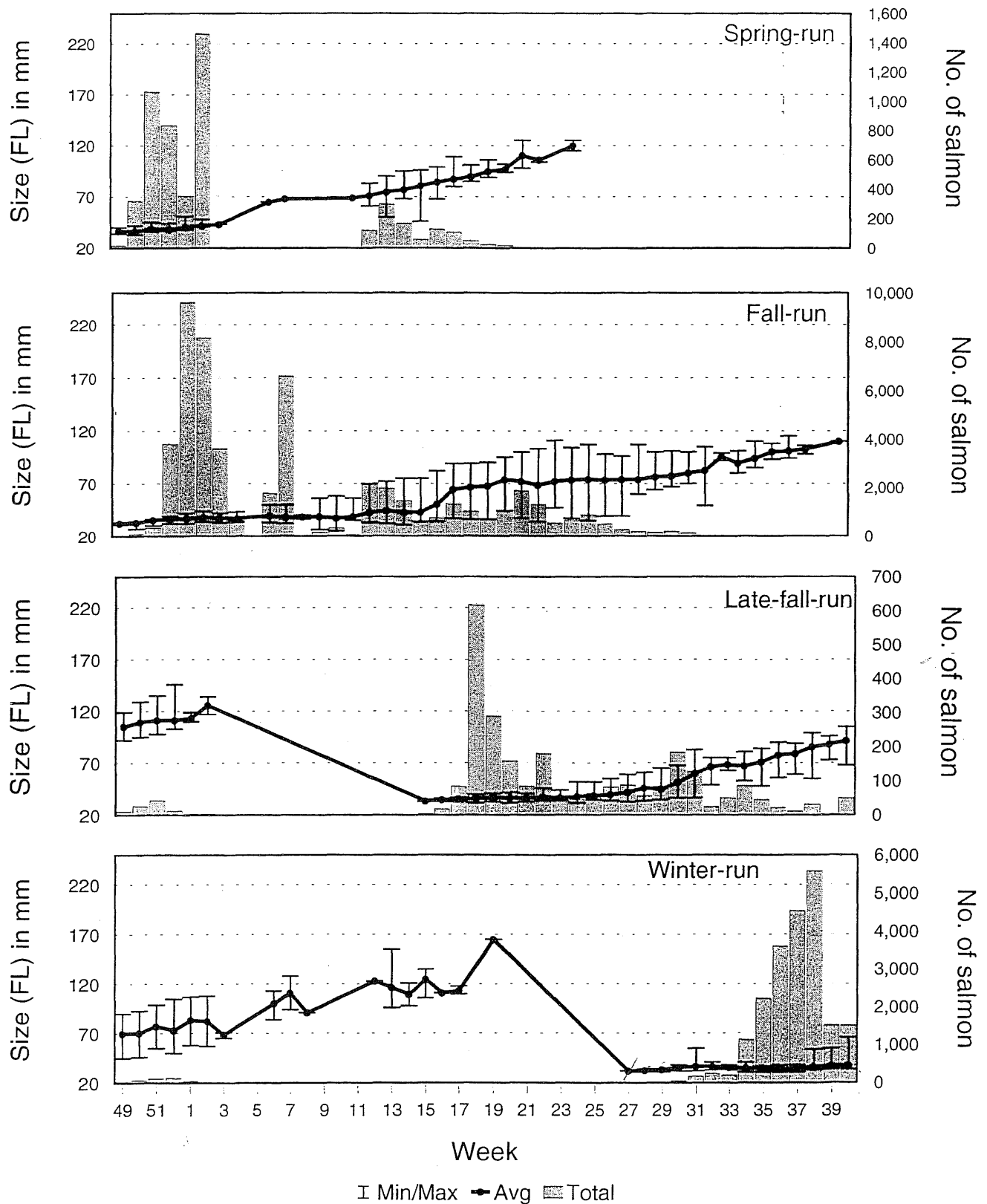


Figure 40. Weekly catch and size statistics for the four races of chinook salmon collected by rotary screw trap in the upper Sacramento River, 1 October, 1999 - 30 September, 2000.

Size and weekly catch statistics for steelhead trout caught during the upper Sacramento River emigration survey, 1999 - 2000

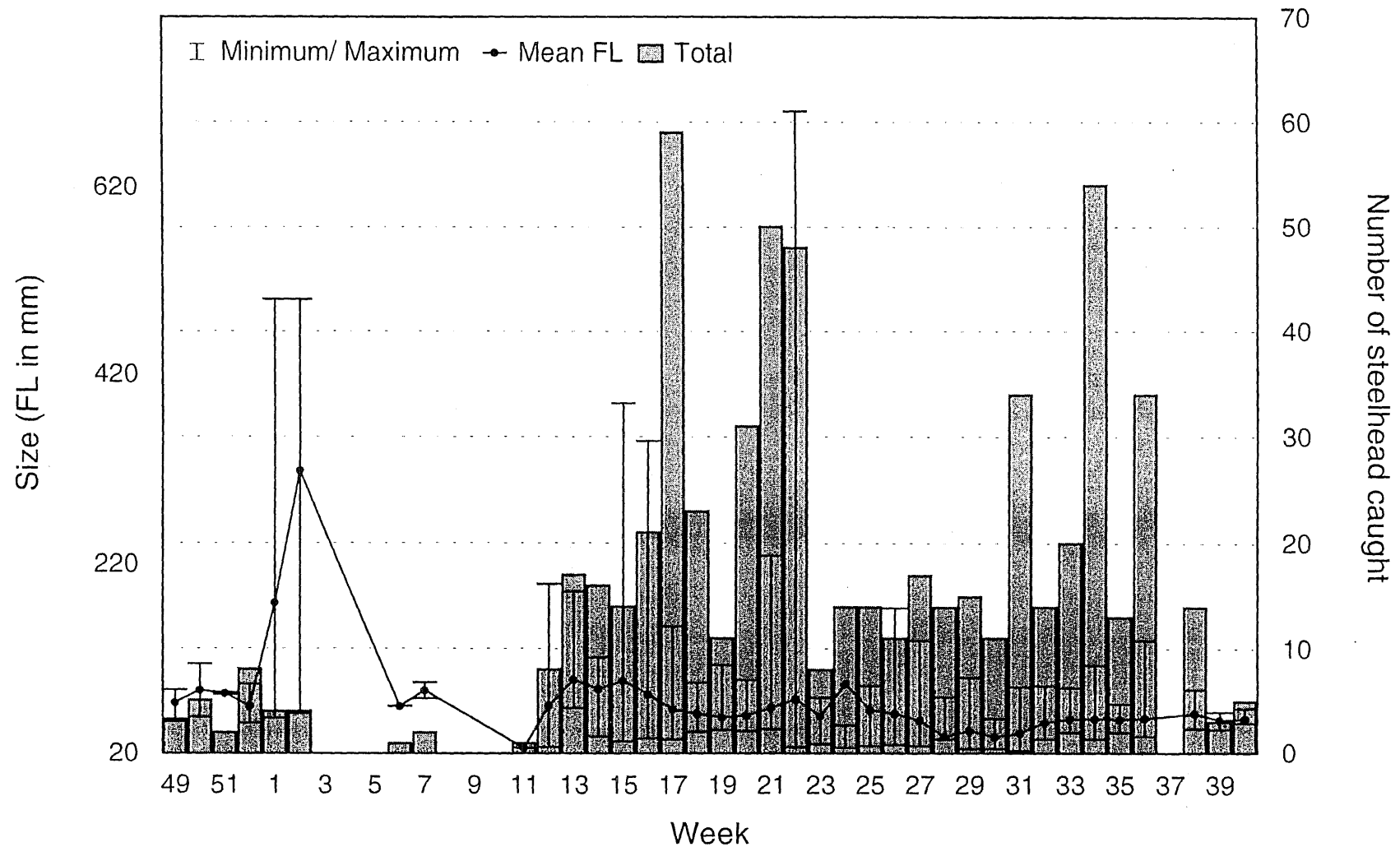


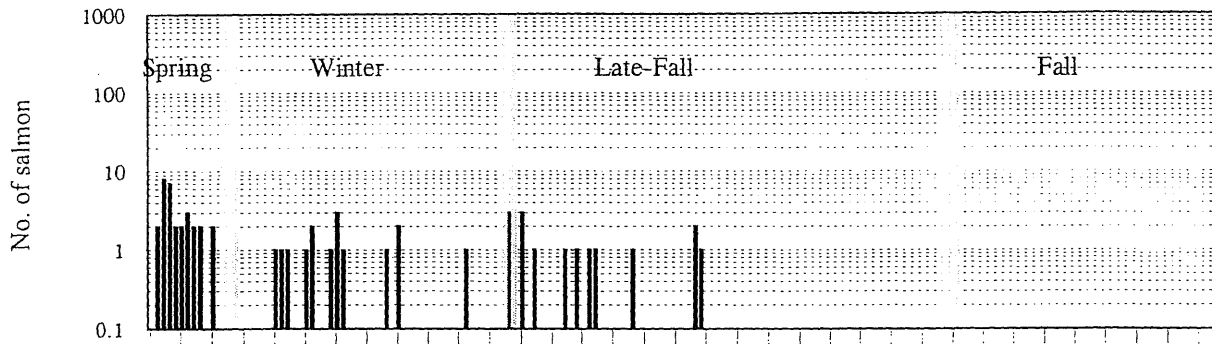
Figure 41. Total steelhead caught and the mean fork length (minimum and maximum) on a weekly basis in the upper Sacramento River, October 1999 - September 2000.

APPENDIX II

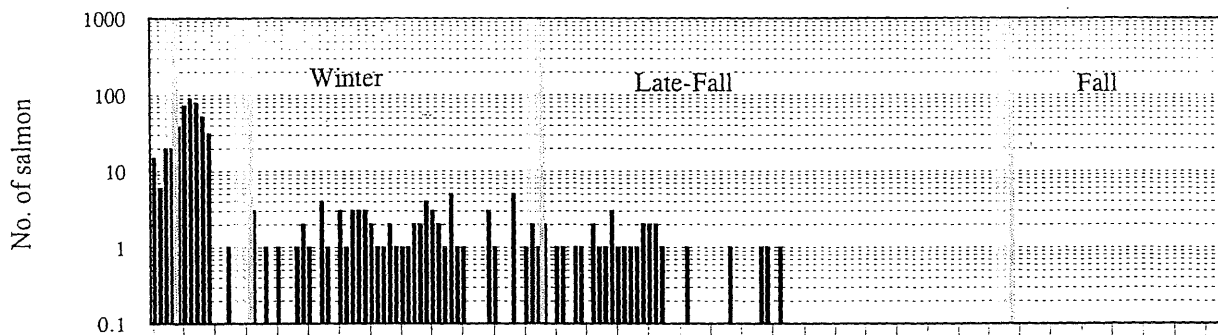
Rotary screw trap catch weekly length distributions

Chinook salmon size distribution Upper Sacramento River rotary screw trap

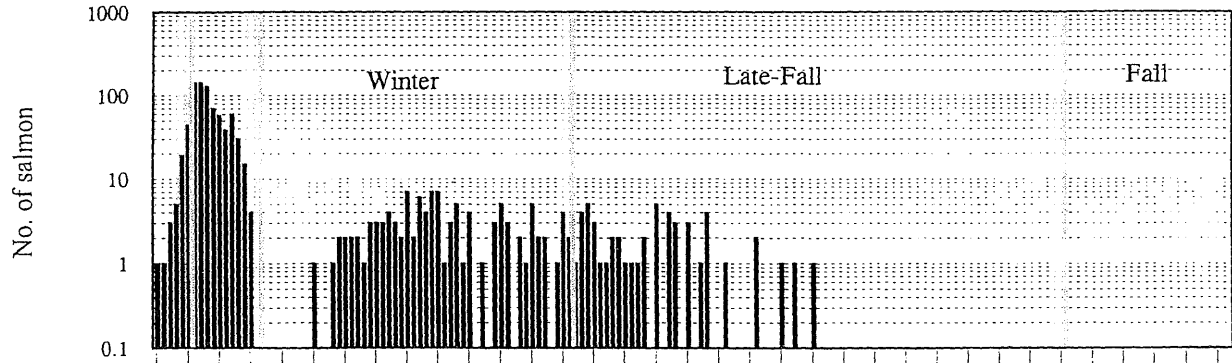
Week 49, 28 Nov-4 Dec 1999



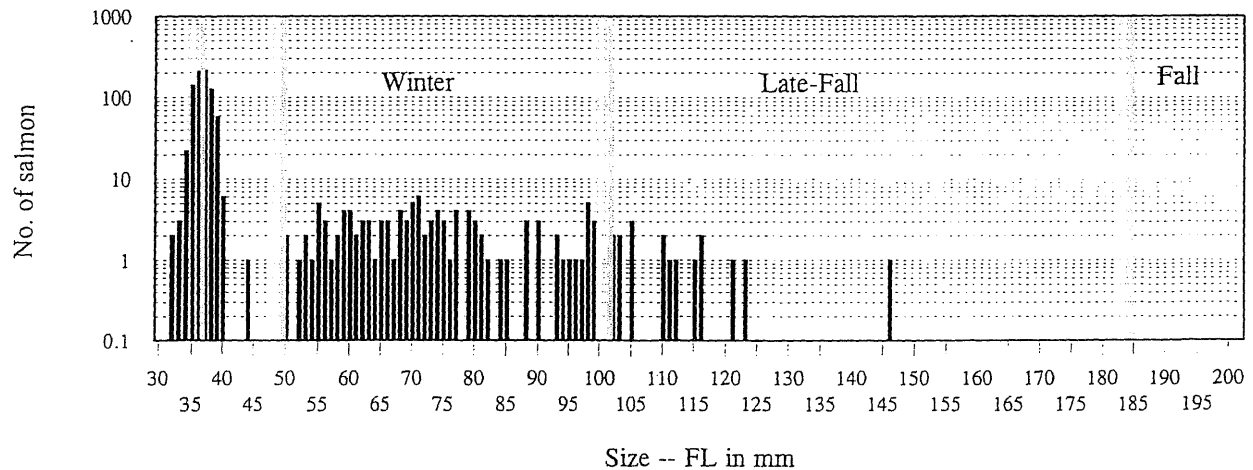
Week 50, 5-11 Dec 1999



Week 51, 12-18 Dec 1999



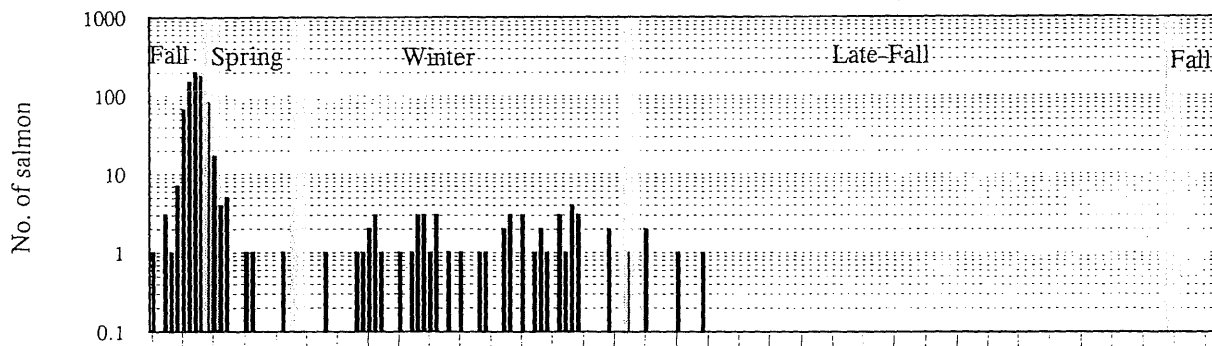
Week 52, 19-25 Dec 1999



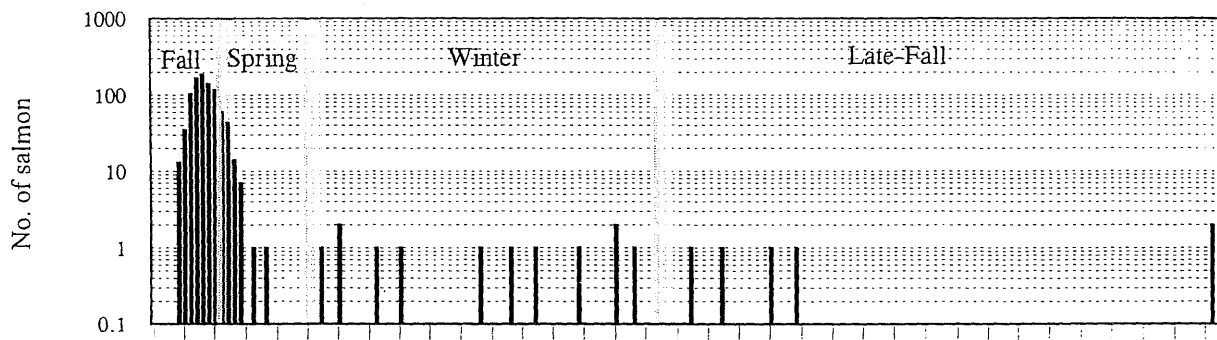
II-1. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 28 November - 25 December 1999.

Chinook salmon size distribution Upper Sacramento River rotary screw trap

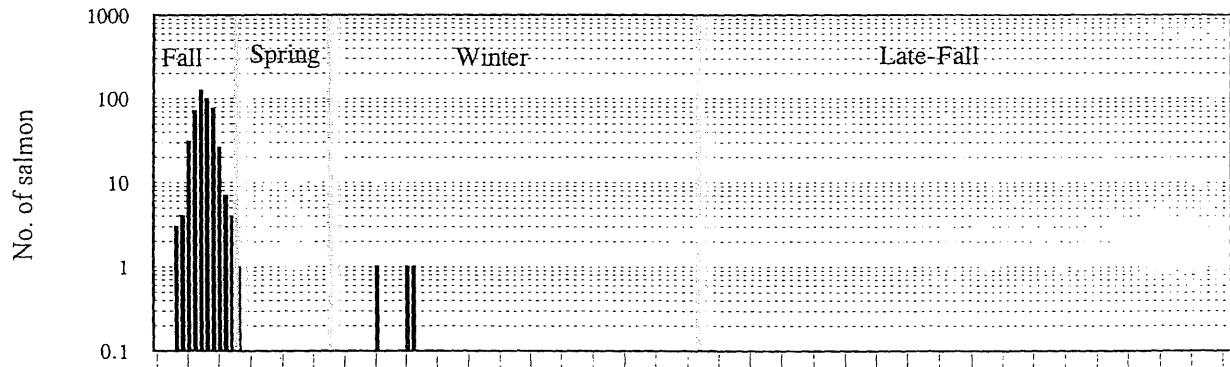
Week 1, 26 Dec 1999-1 Jan 2000



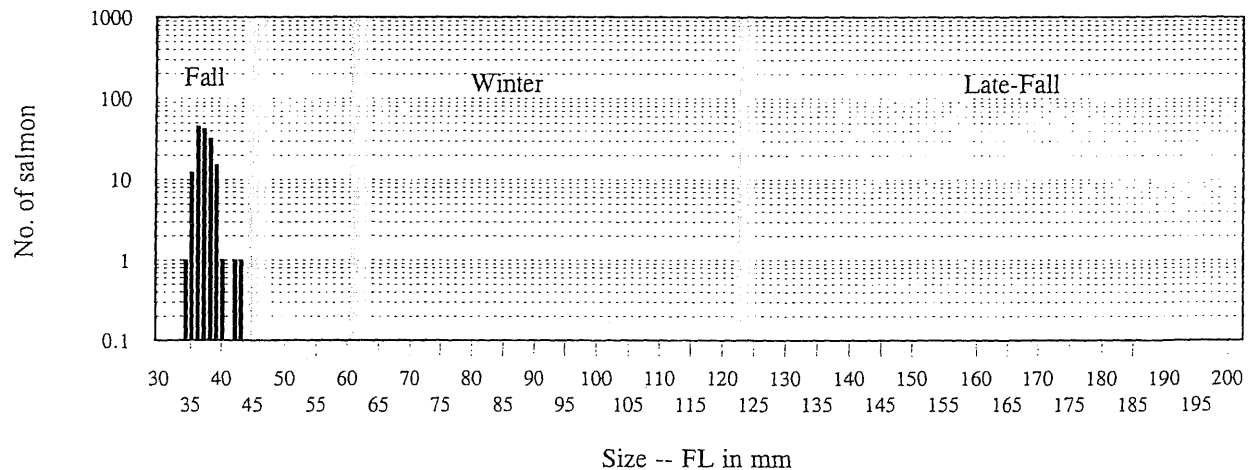
Week 2, 2-8 Jan 2000



Week 3, 9-15 Jan 2000

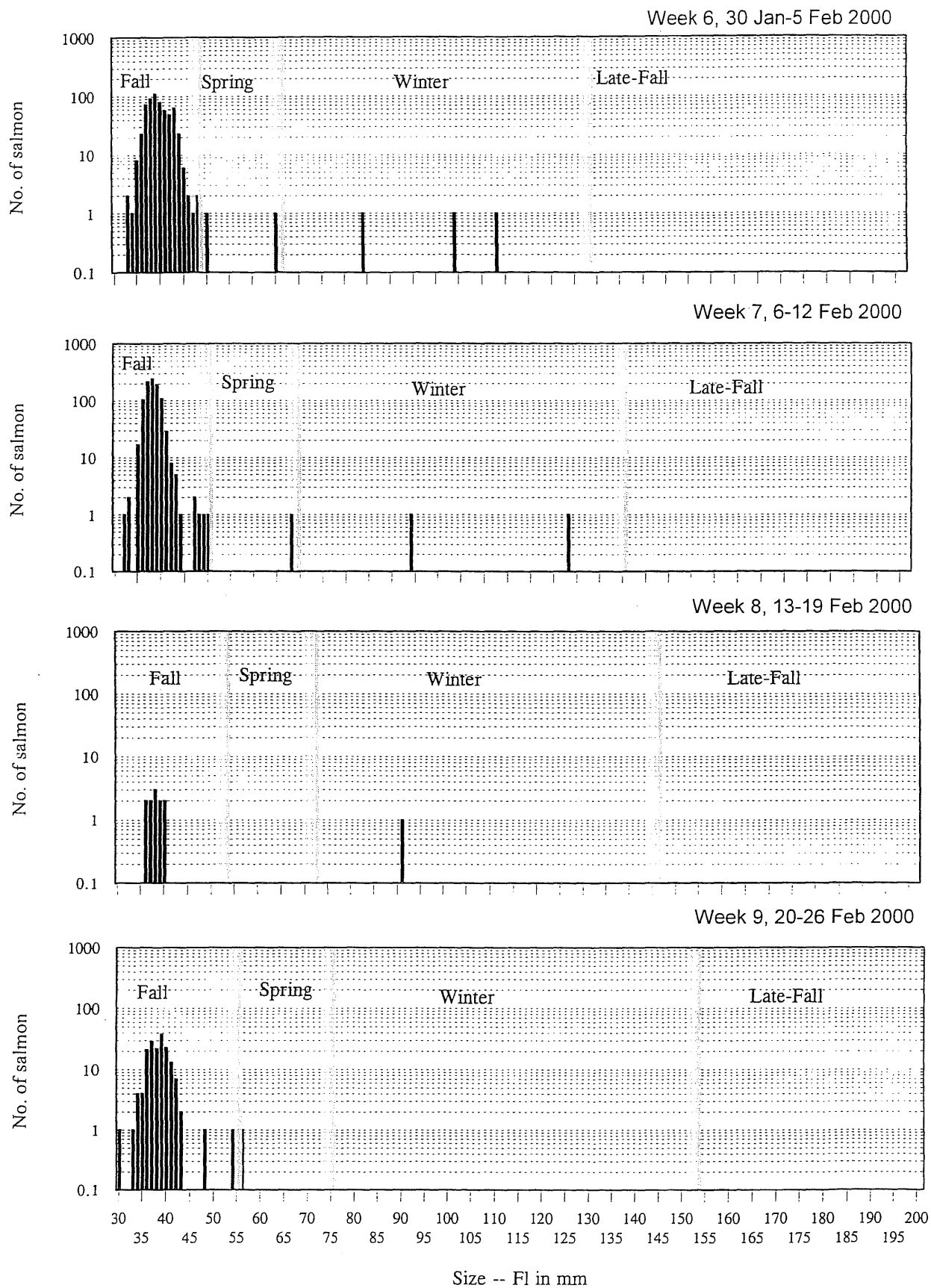


Week 4, 16-22 Jan 2000



II-2. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 26 December 1999 - 22 January 2000.

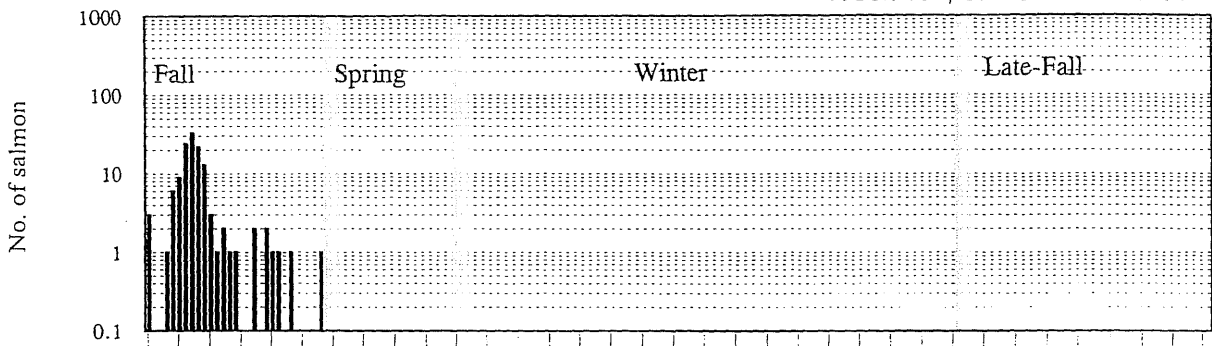
Chinook salmon size distribution Upper Sacramento River rotary screw trap



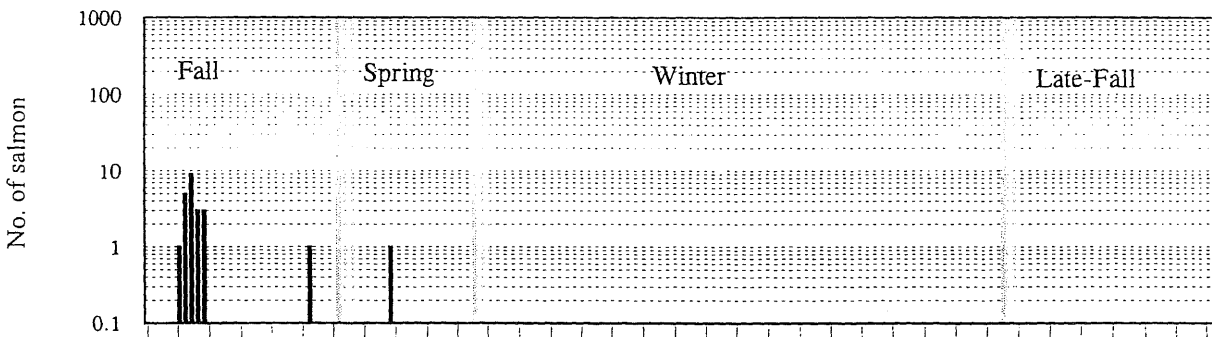
II-3. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 30 January - 26 February 2000.

Chinook salmon size distribution Upper Sacramento River rotary screw trap

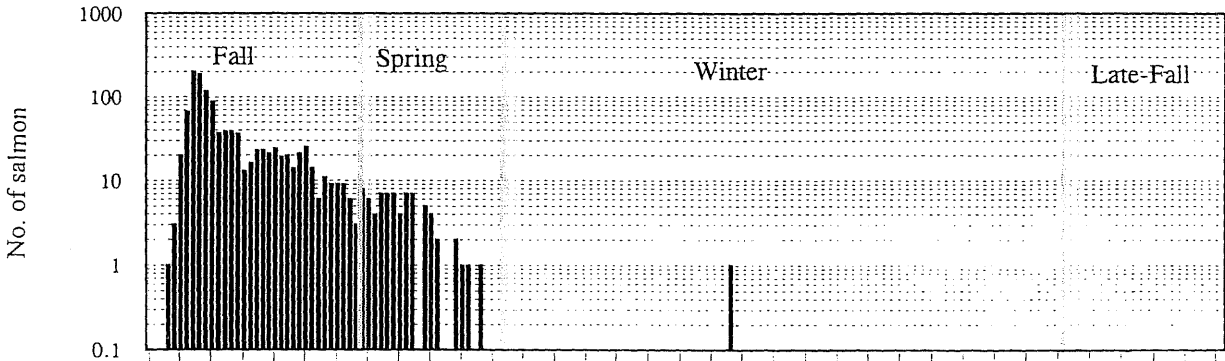
Week 10 , 27 Feb-4 Mar 2000



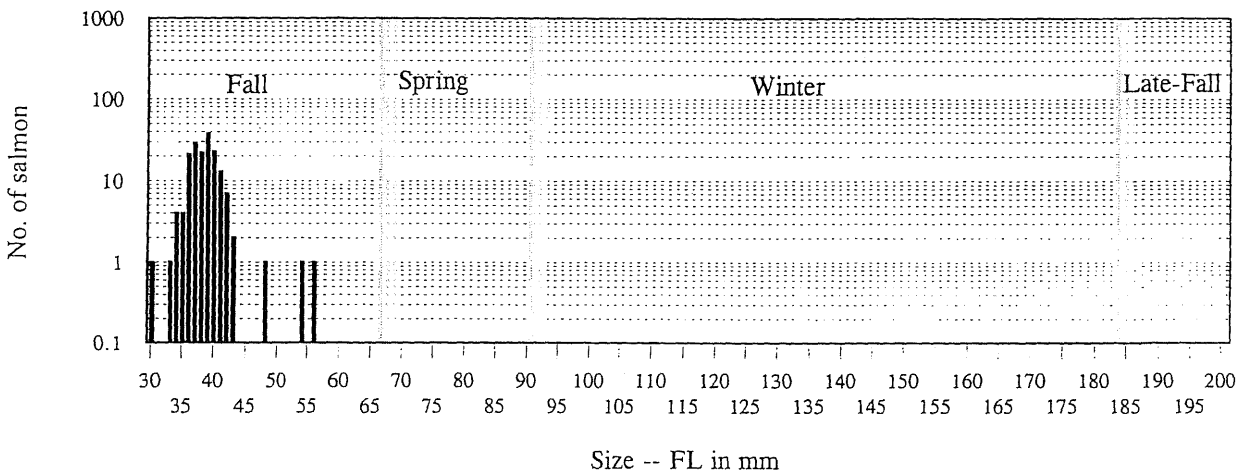
Week 11, 5-11 Mar 2000



Week 12, 12-18 Mar 2000



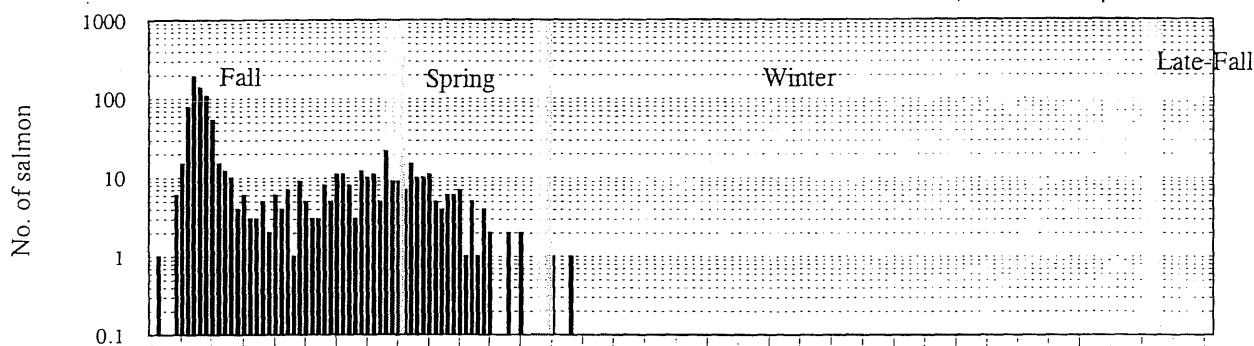
Week 13, 19-25 Mar 2000



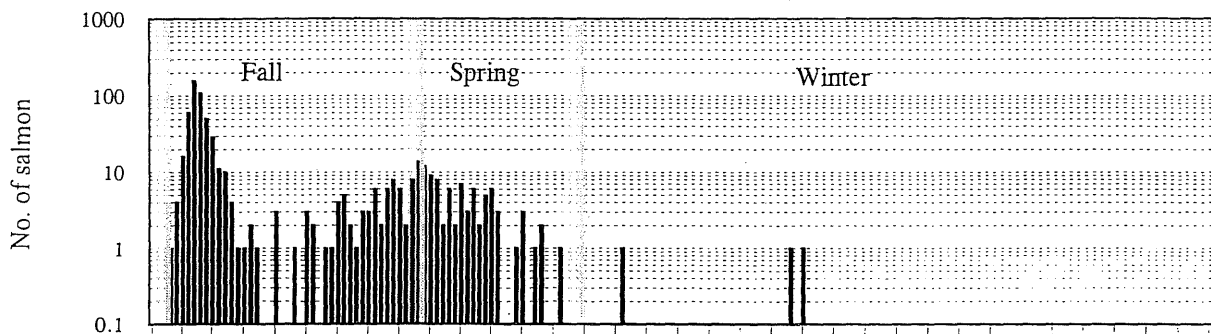
II-4. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 27 February - 25 March 2000.

Chinook salmon size distribution Upper Sacramento River rotary screw trap

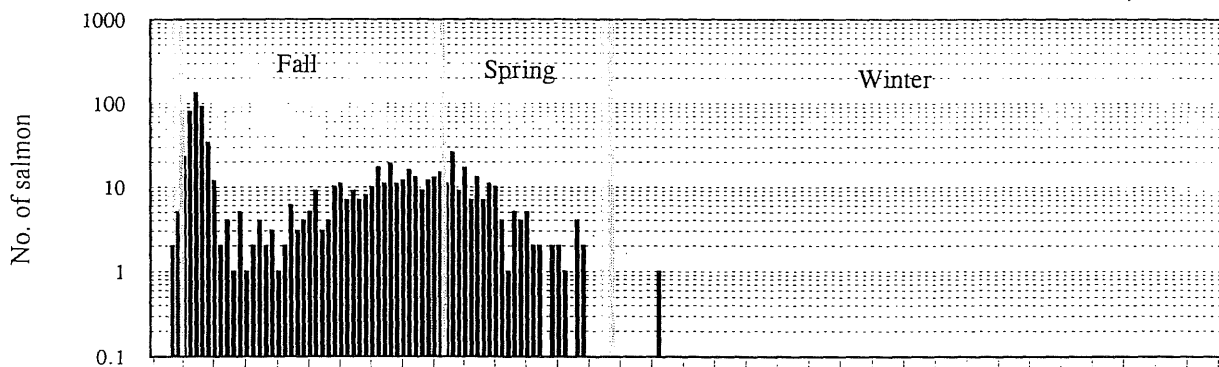
Week 14, 26 Mar-1 Apr 2000



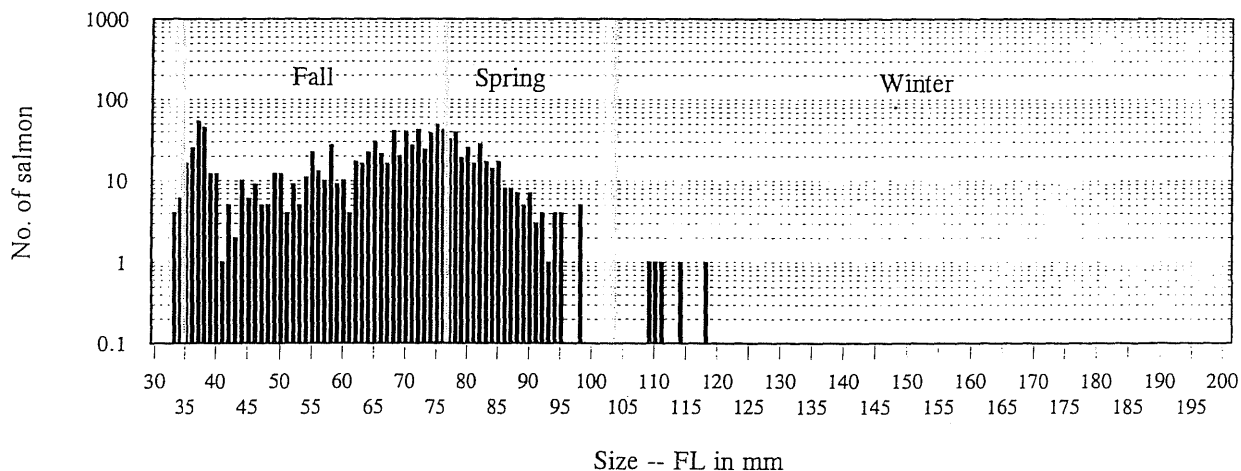
Week 15, 2-8 Apr 2000



Week 16, 9-15 Apr 2000



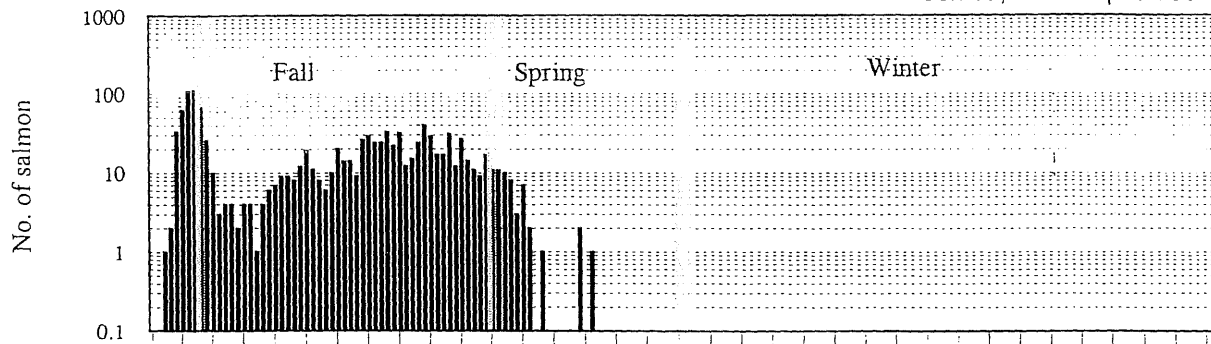
Week 17, 16-22 Apr 2000



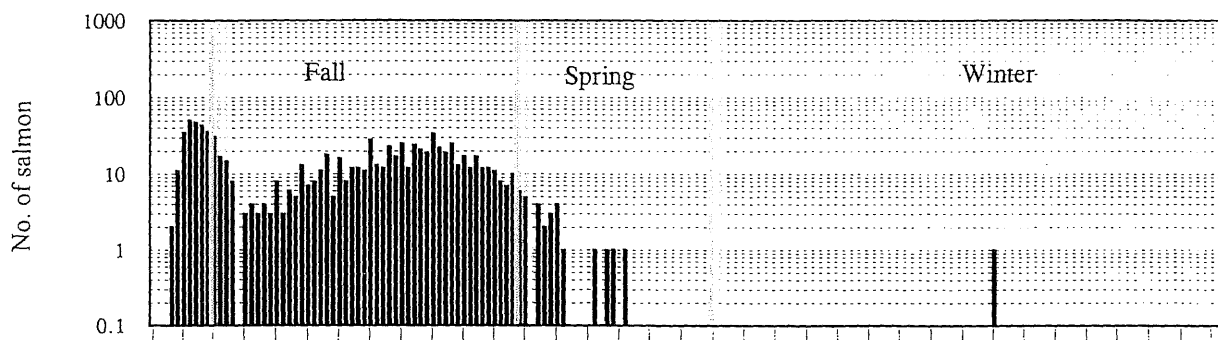
II-5. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 26 March - 22 April 2000.

Chinook salmon size distribution Upper Sacramento River rotary screw trap

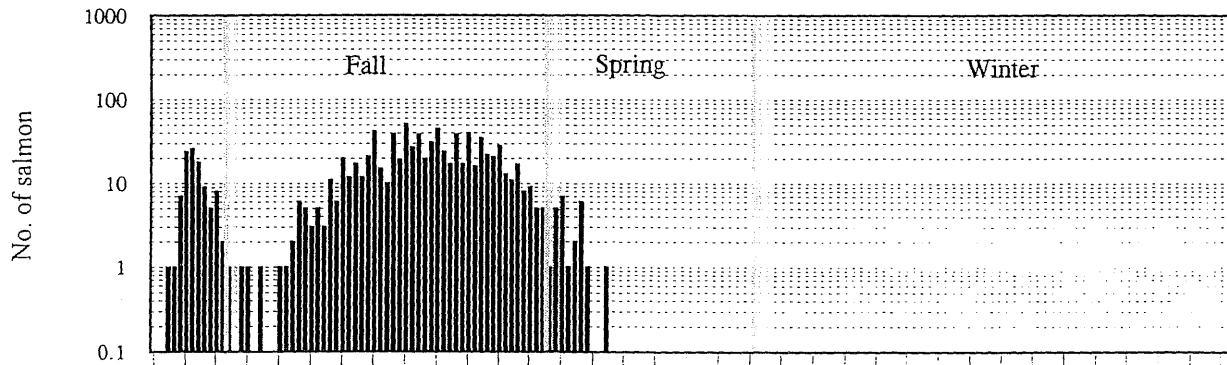
Week 18, 23-29 Apr 2000



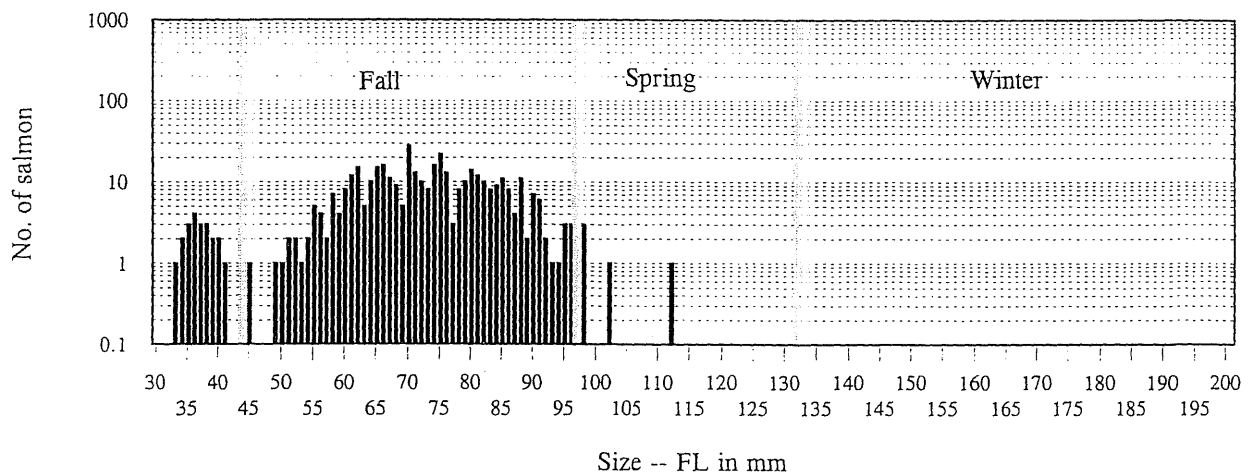
Week 19, 30 Apr-6 May 2000



Week 20, 7-13 May 2000

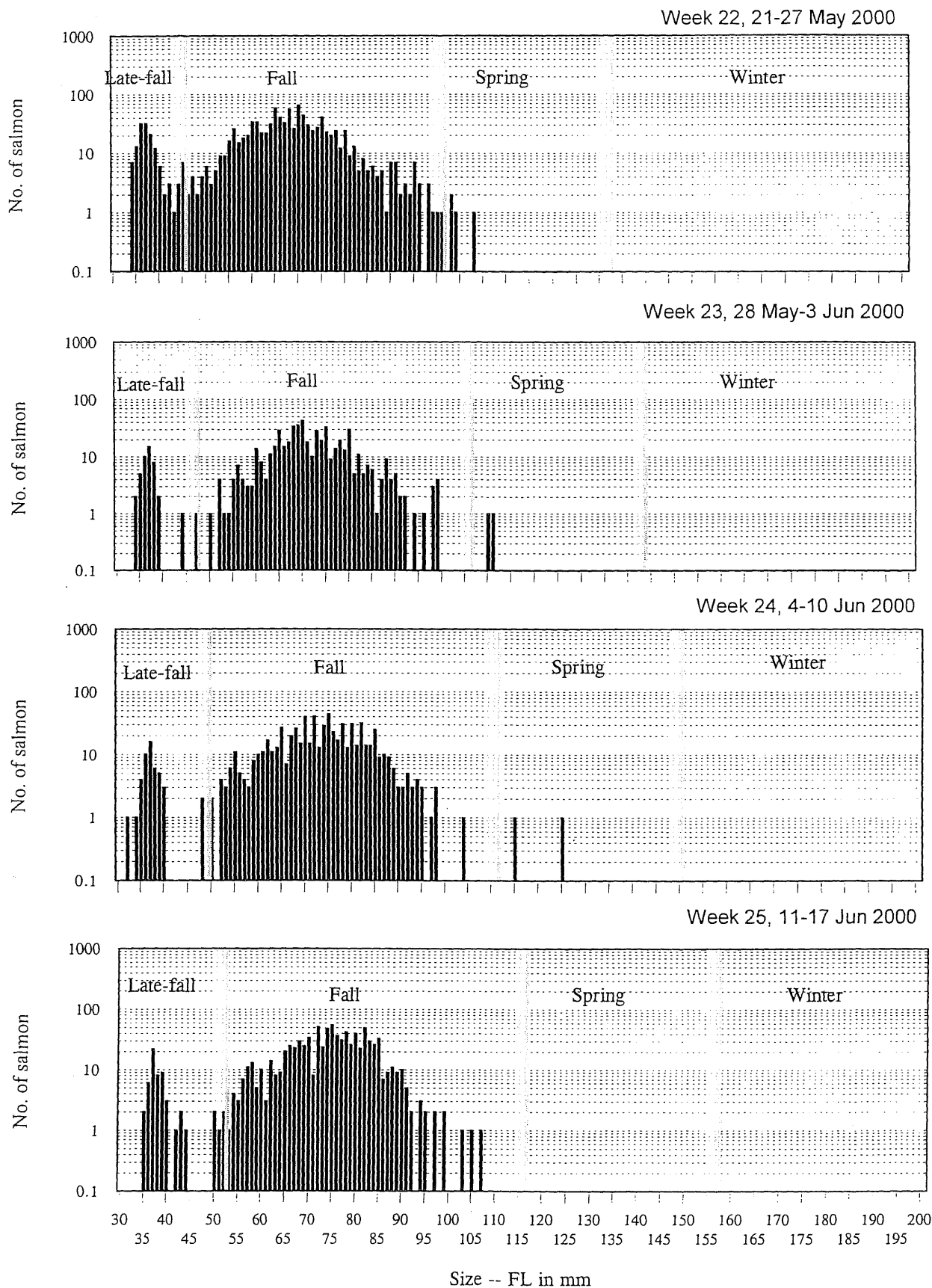


Week 21, 14-20 May 2000



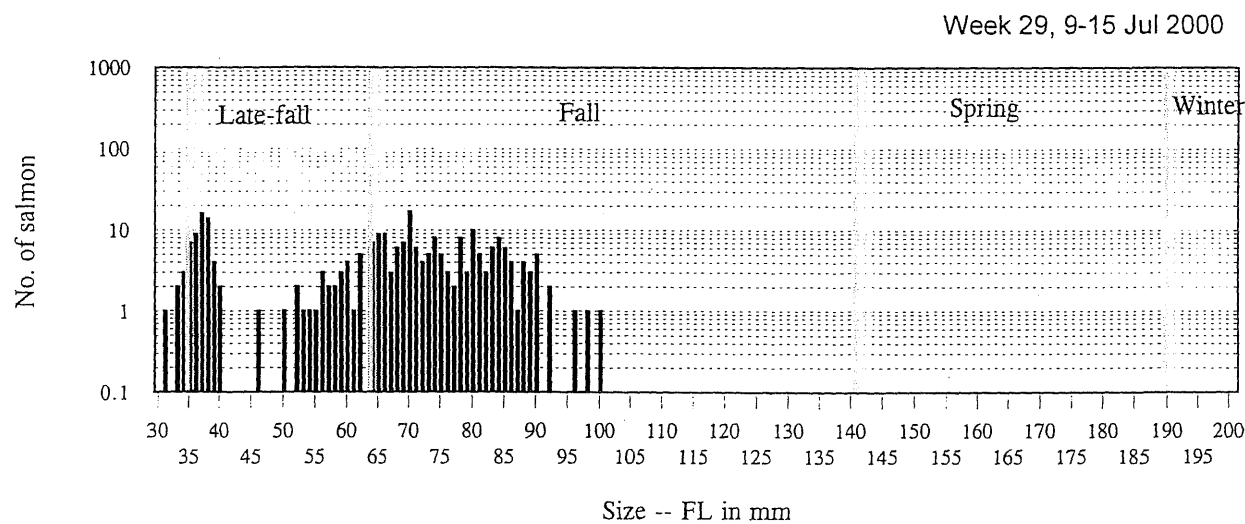
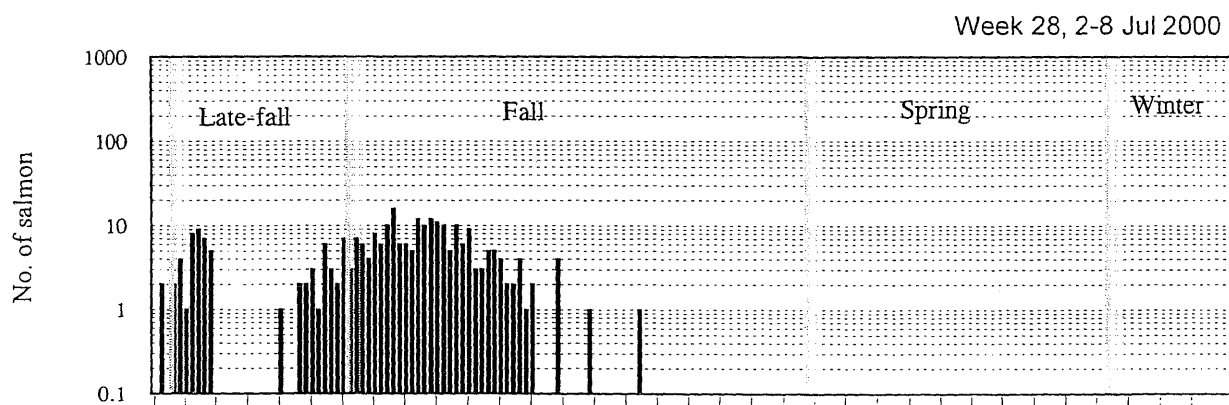
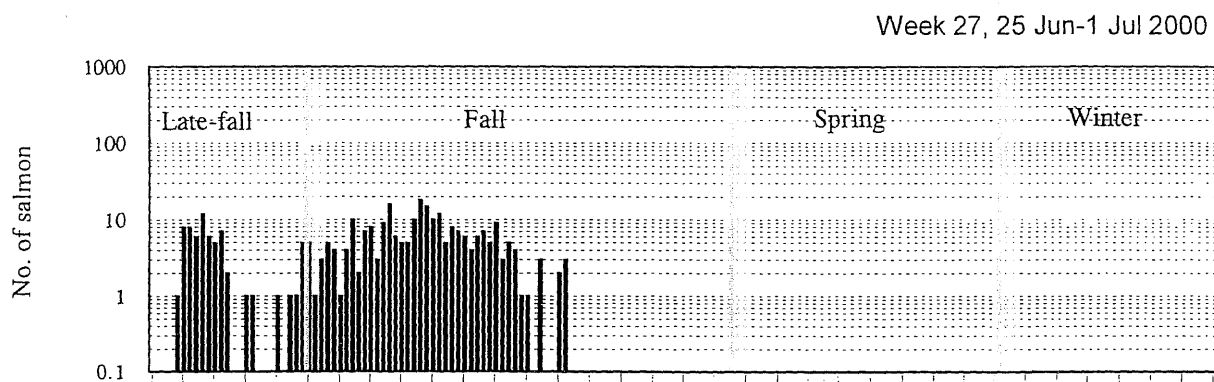
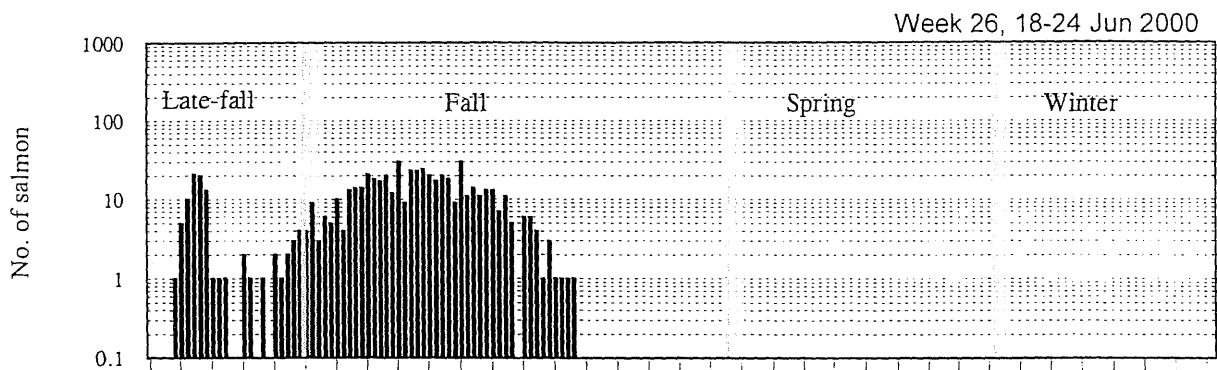
II-6. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 23 April - 20 May 2000.

Chinook salmon size distribution Upper Sacramento River rotary screw trap

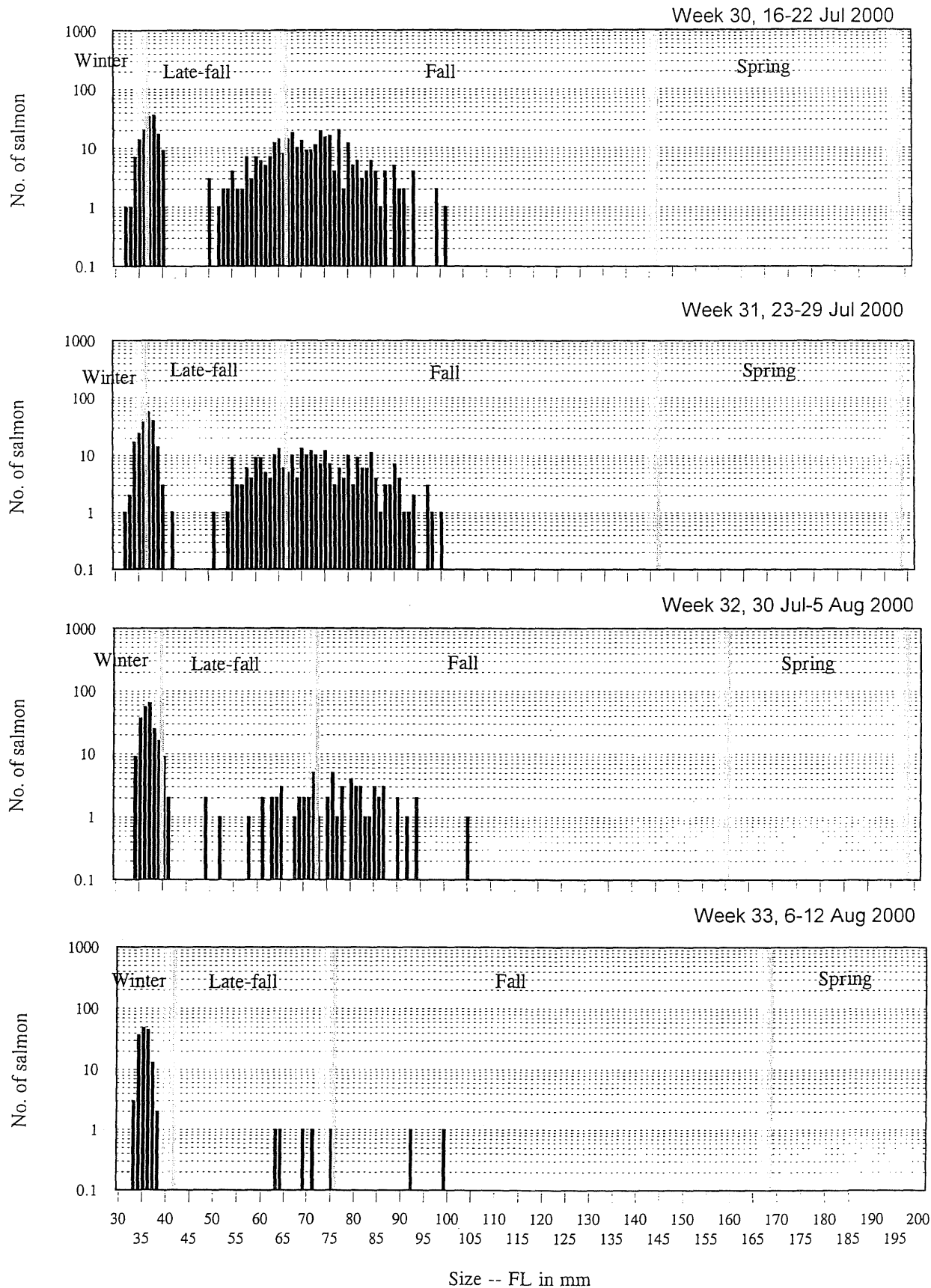


II-7. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 21 May - 17 June 2000.

Chinook salmon size distribution Upper Sacramento River rotary screw trap

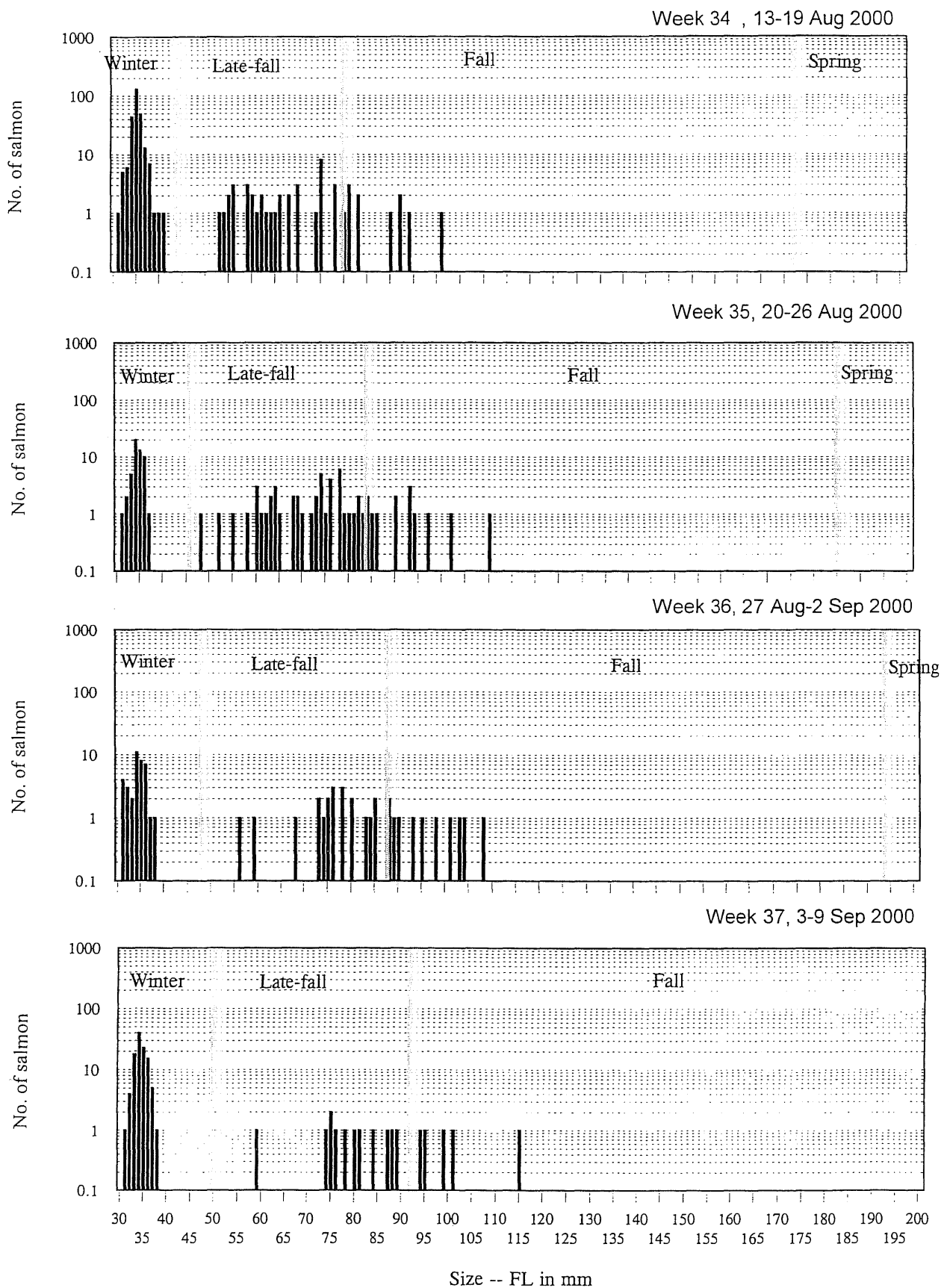


Chinook salmon size distribution Upper Sacramento River rotary screw trap



II-9. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 16 July - 5 August 2000.

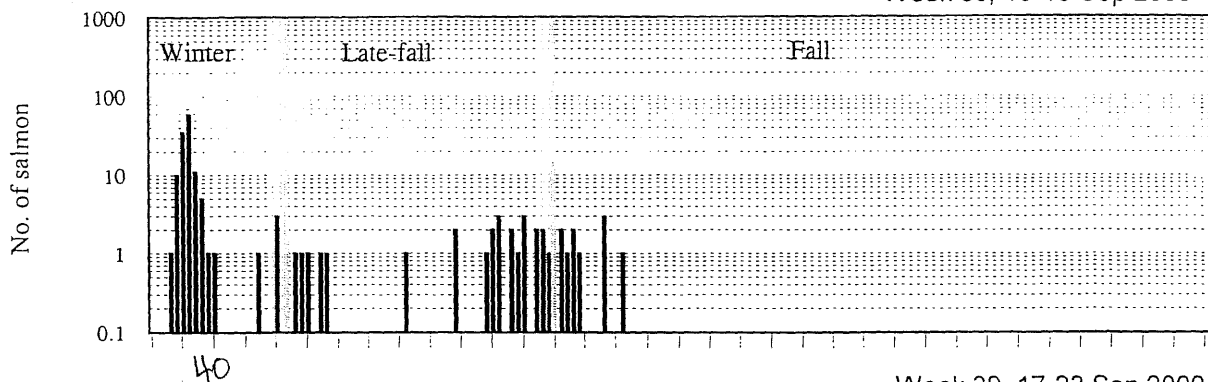
Chinook salmon size distribution Upper Sacramento River rotary screw trap



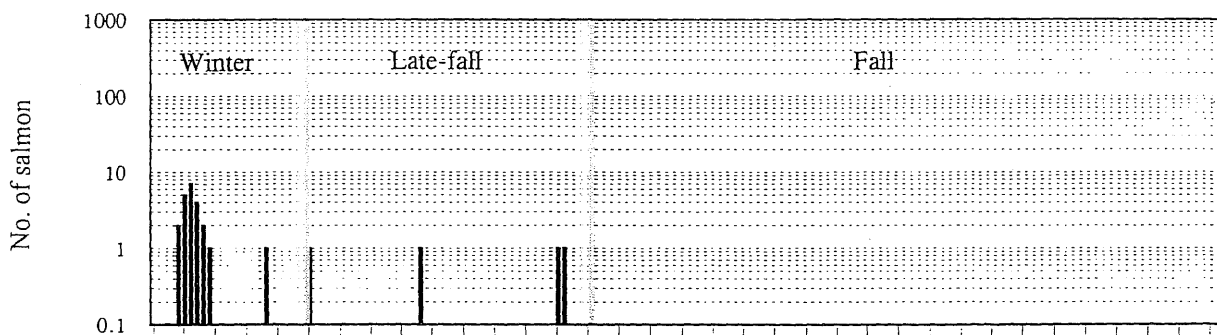
II-10. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 13 August - 9 September 2000.

Chinook salmon size distribution Upper Sacramento River rotary screw trap

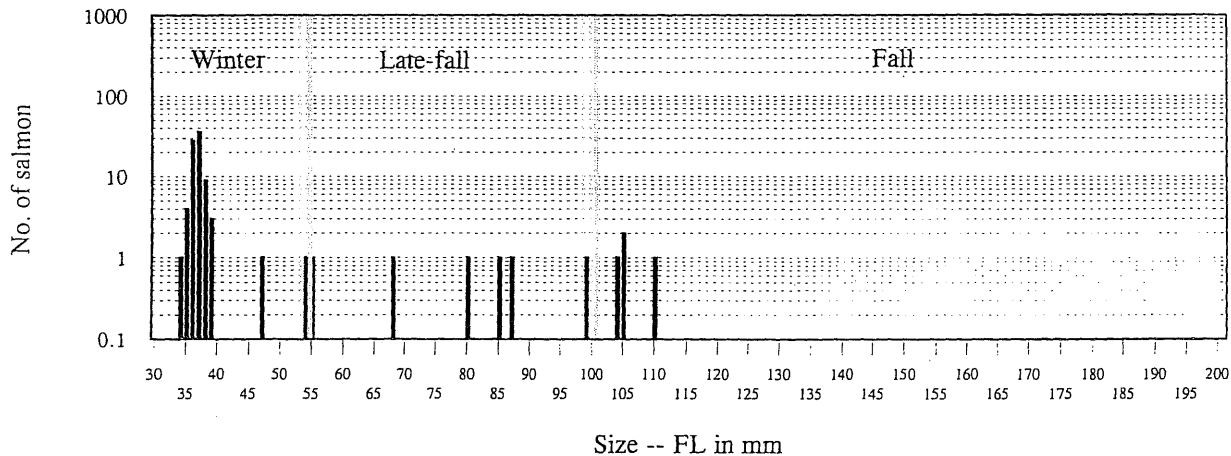
Week 38, 10-16 Sep 2000



Week 39, 17-23 Sep 2000

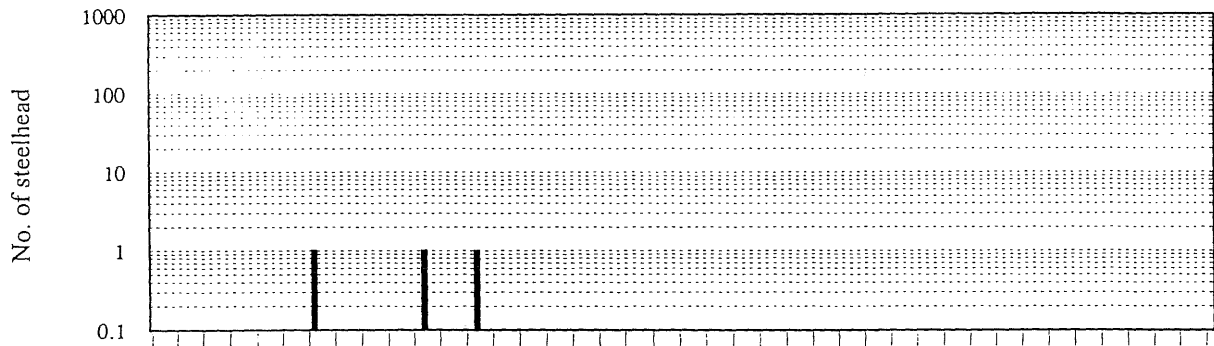


Week 40, 24-30 Sep 2000

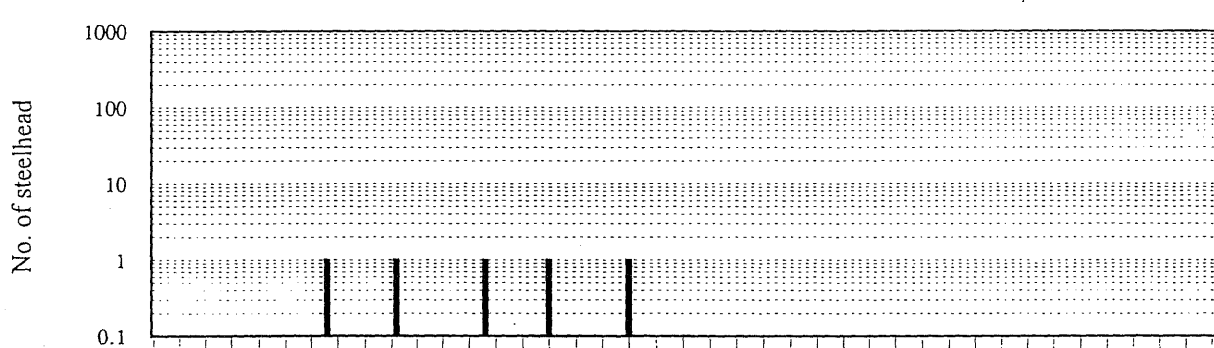


Steelhead size distribution Upper Sacramento River rotary screw trap

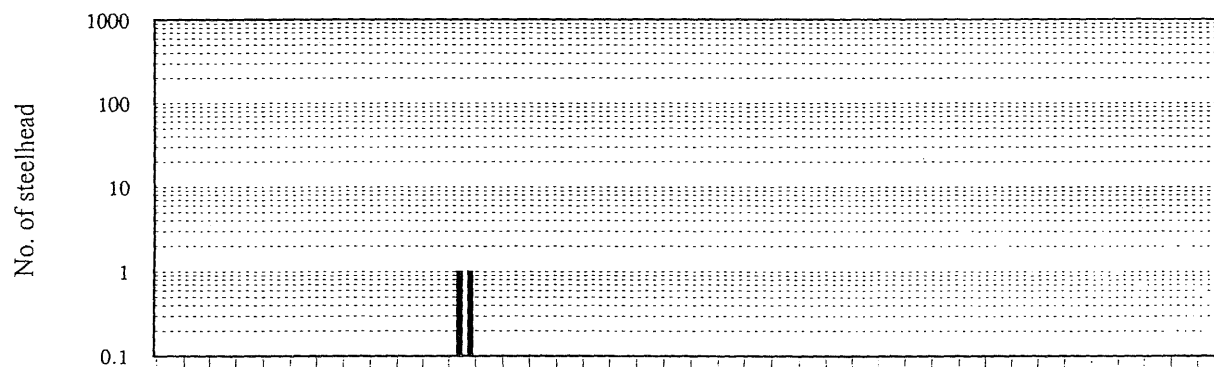
Week 49, 28 Nov-4 Dec 1999



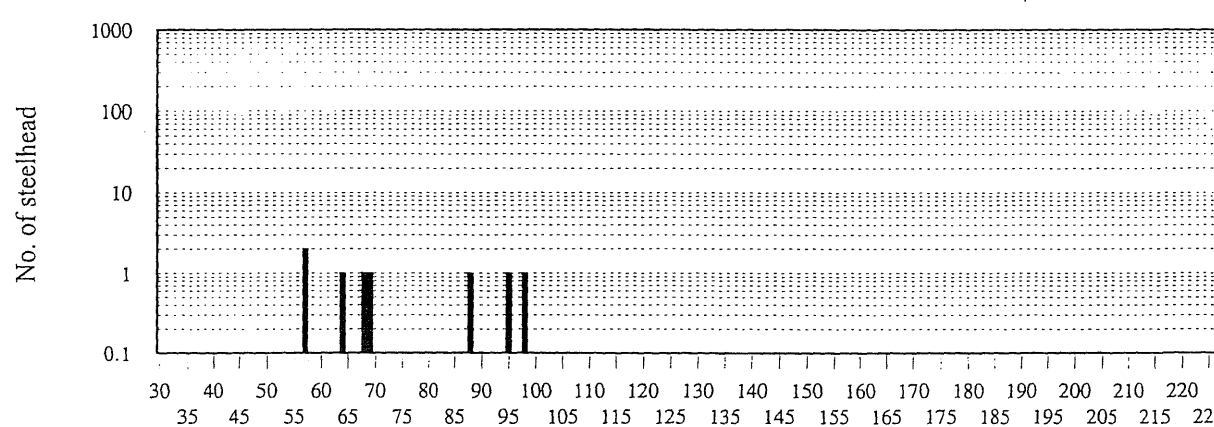
Week 50, 5-11 Dec 1999



Week 51, 12-18 Dec 1999



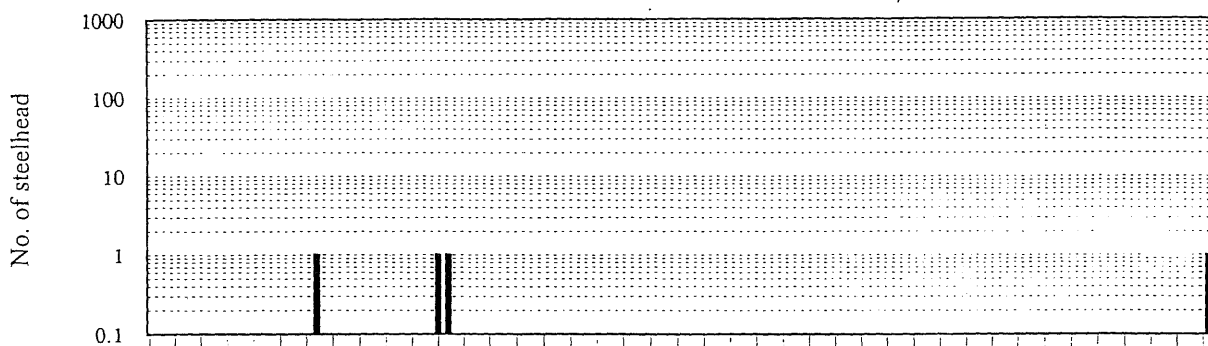
Week 52, 19-25 Dec 1999



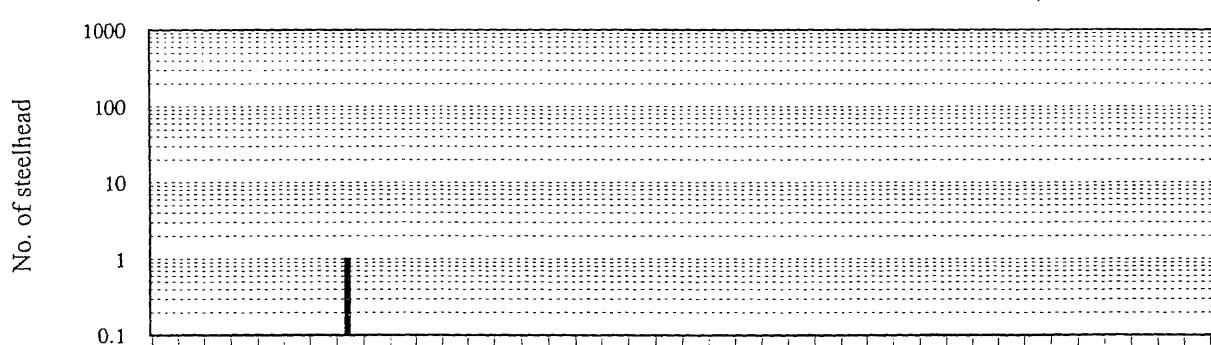
Size -- FL in mm

Steelhead size distribution Upper Sacramento River rotary screw trap

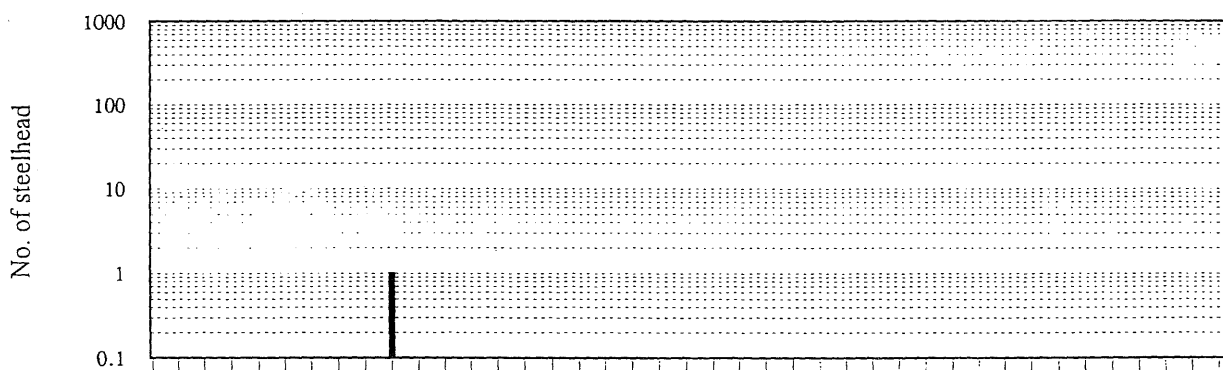
Week 1, 26 Dec 1999-1 Jan 2000



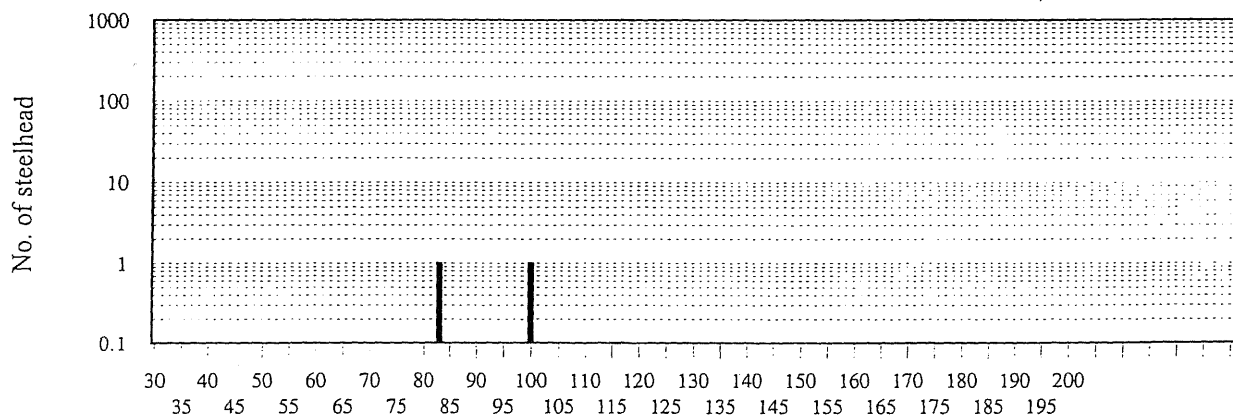
Week 2, 2-8 Jan 2000



Week 6, 30 Jan-5 Feb 2000



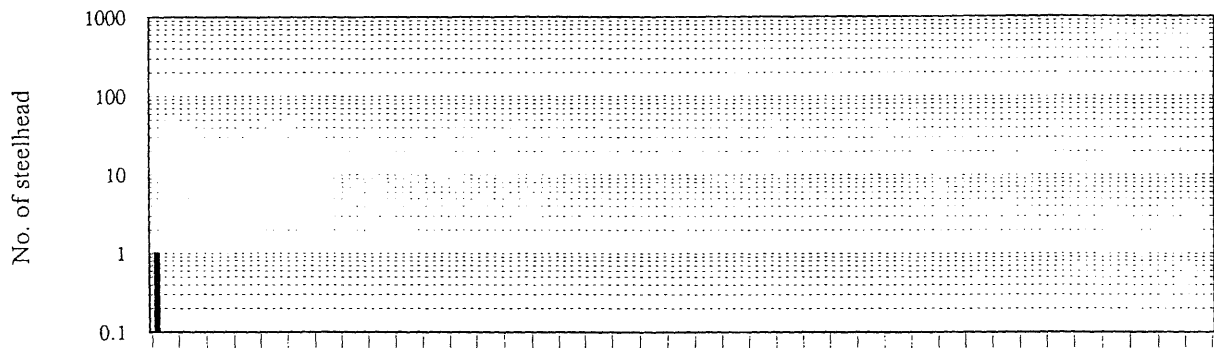
Week 7, 6-12 Feb 2000



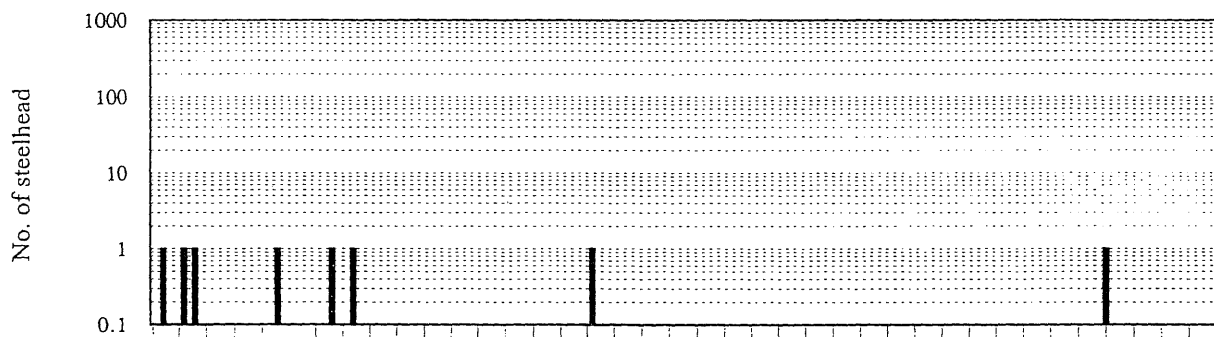
Size -- FL in mm

Steelhead size distribution Upper Sacramento River rotary screw trap

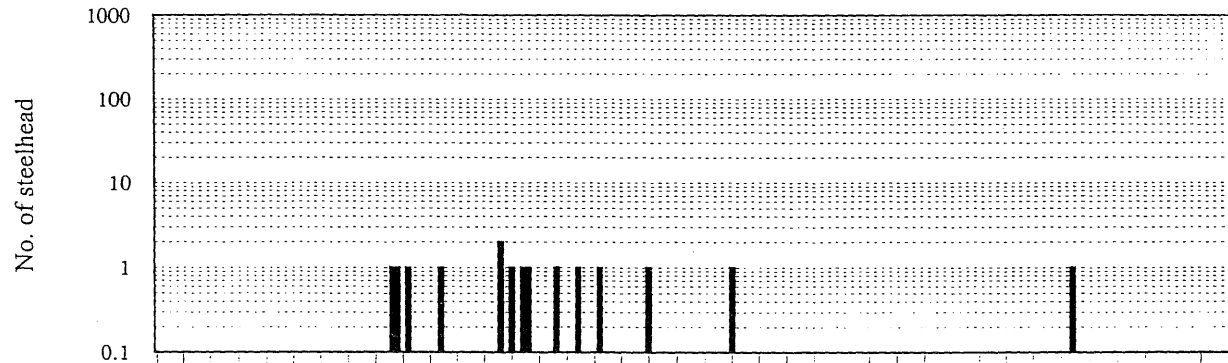
Week 11, 5-11 Mar 2000



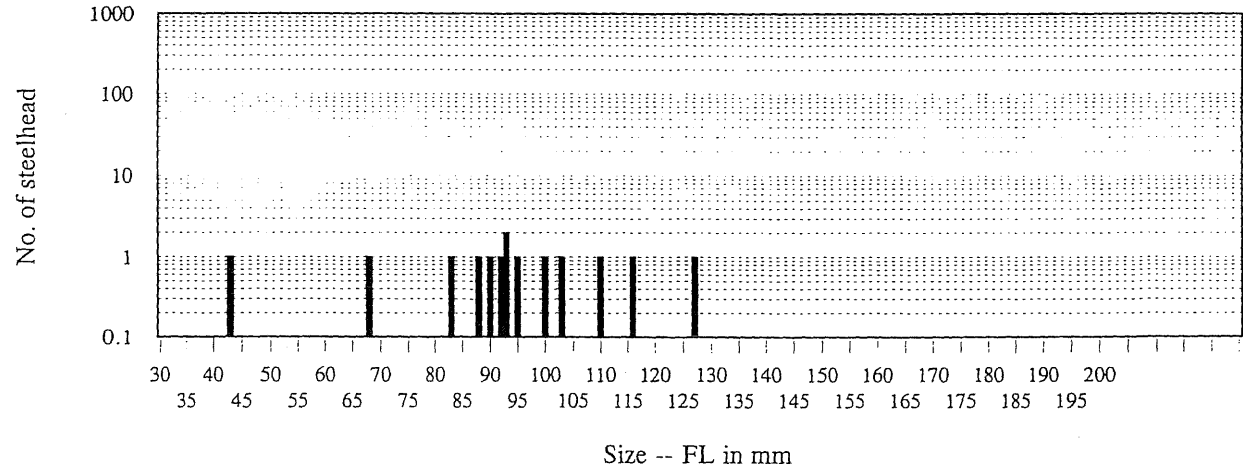
Week 12, 12-17 Mar 2000



Week 13, 18-24 Mar 2000

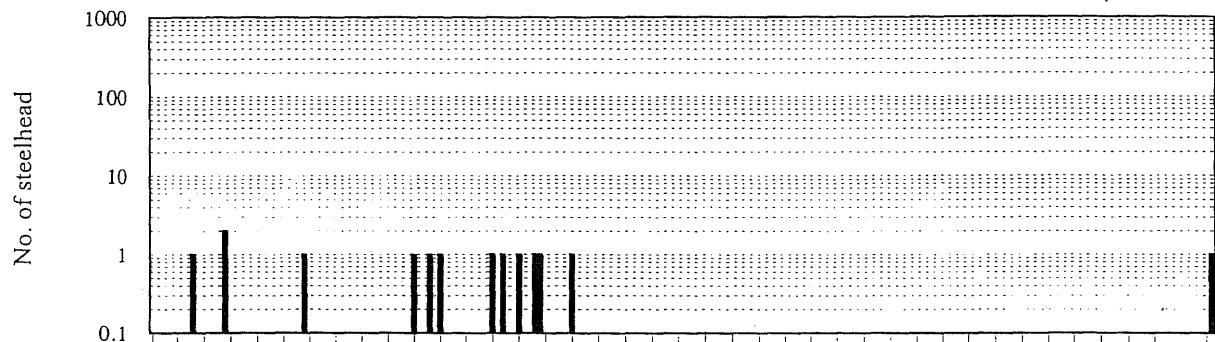


Week 14, 25 Mar-1 Apr 2000

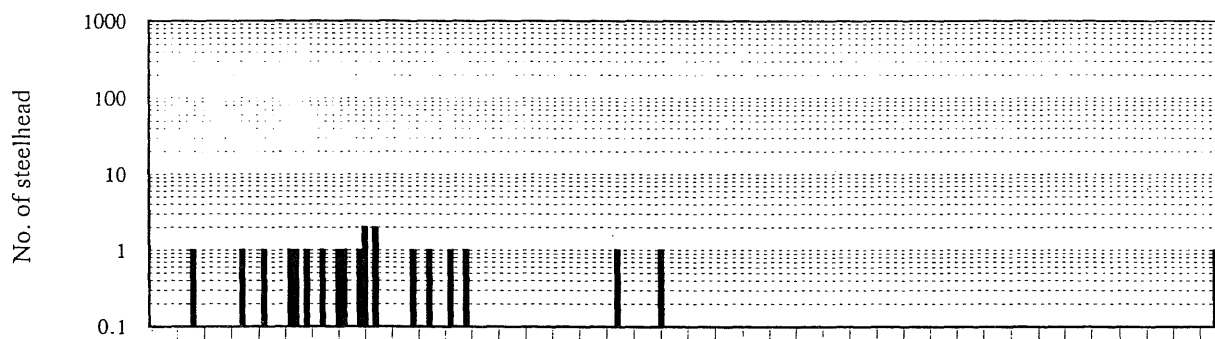


Steelhead size distribution Upper Sacramento River rotary screw trap

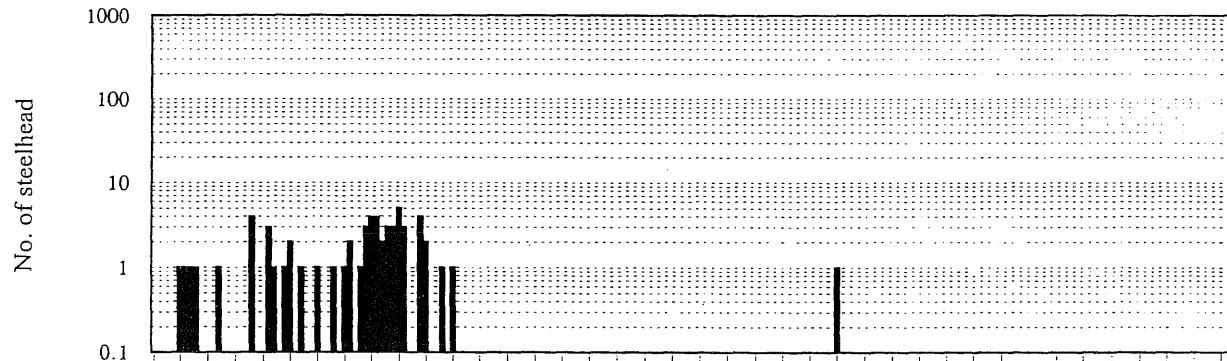
Week 15, 2-8 Apr 2000



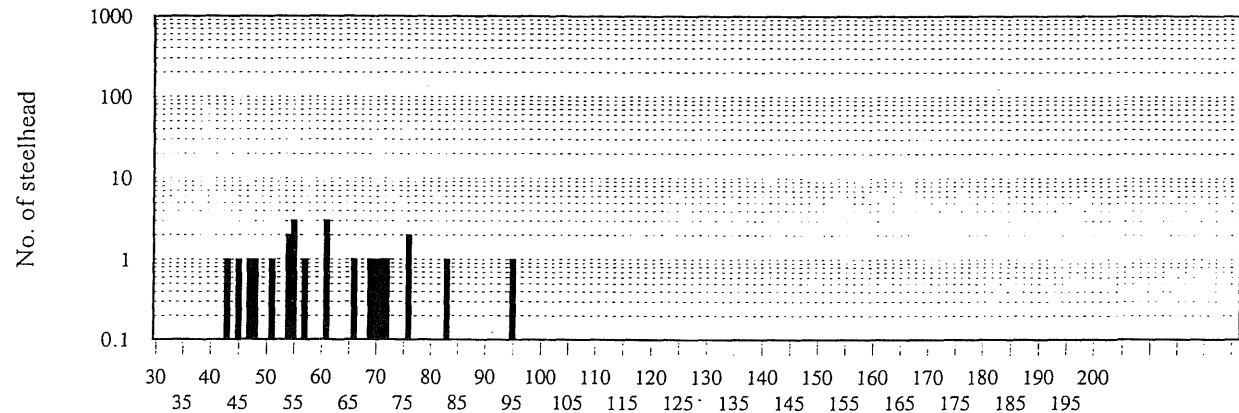
Week 16, 19-15 Apr 2000



Week 17, 16-22 Apr 2000



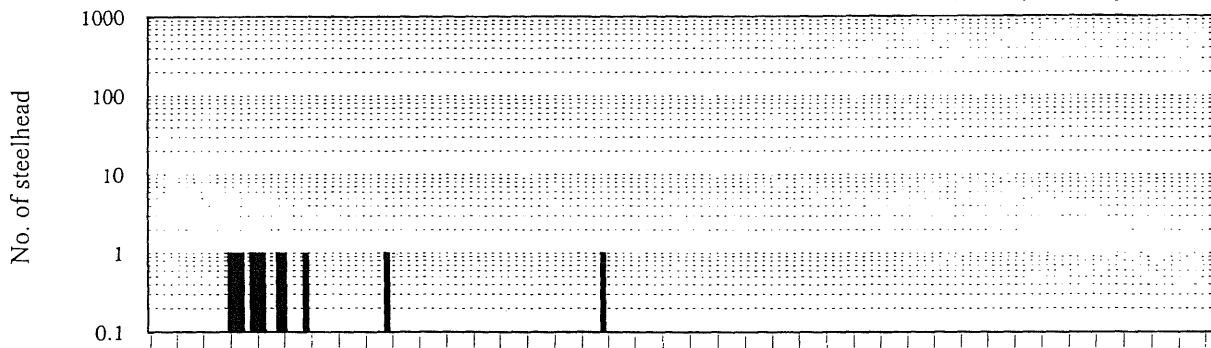
Week 18, 23-29 Apr 2000



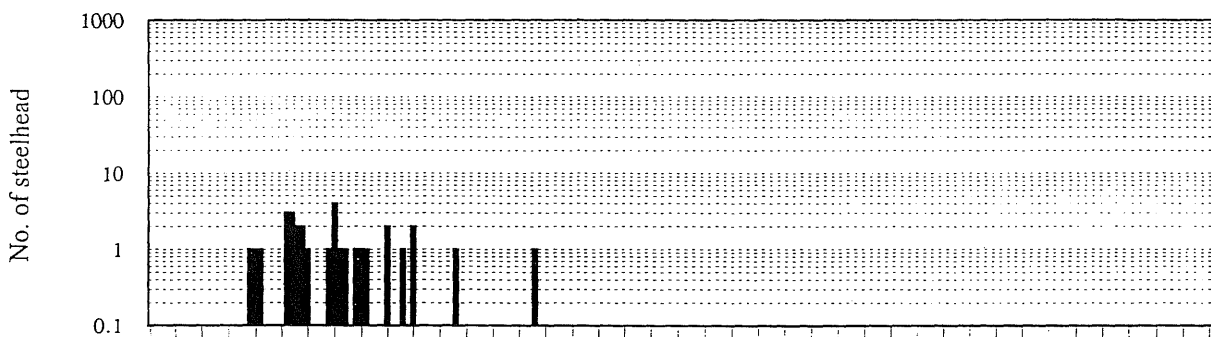
Size -- FL in mm

Steelhead size distribution Upper Sacramento River rotary screw trap

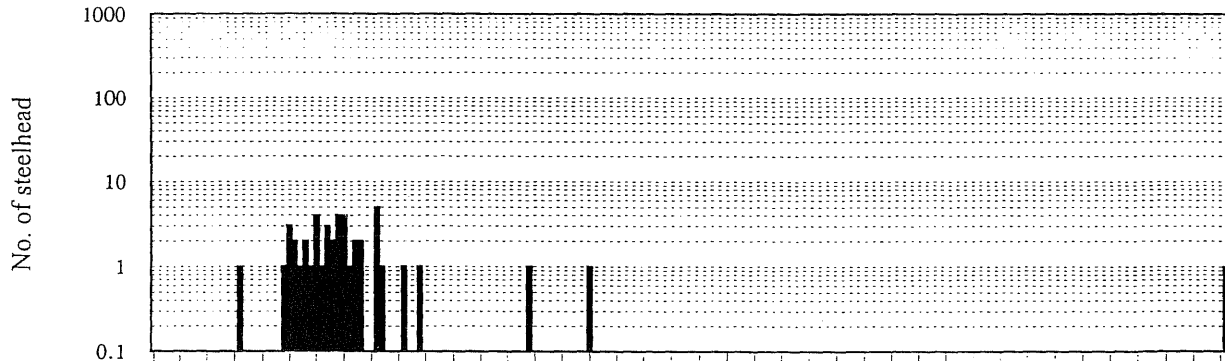
Week 19, 30 Apr-6 May 2000



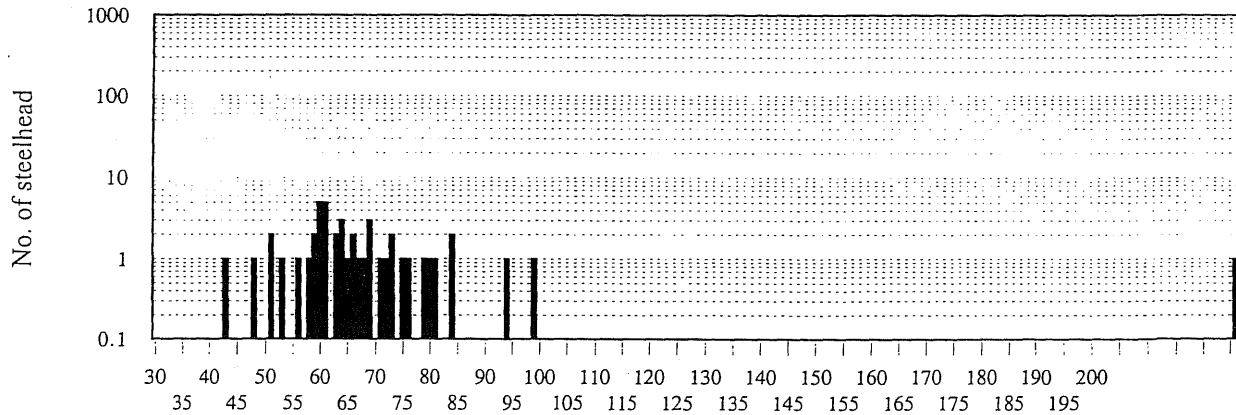
Week 20, 7-13 May 2000



Week 21, 14-20 May 2000



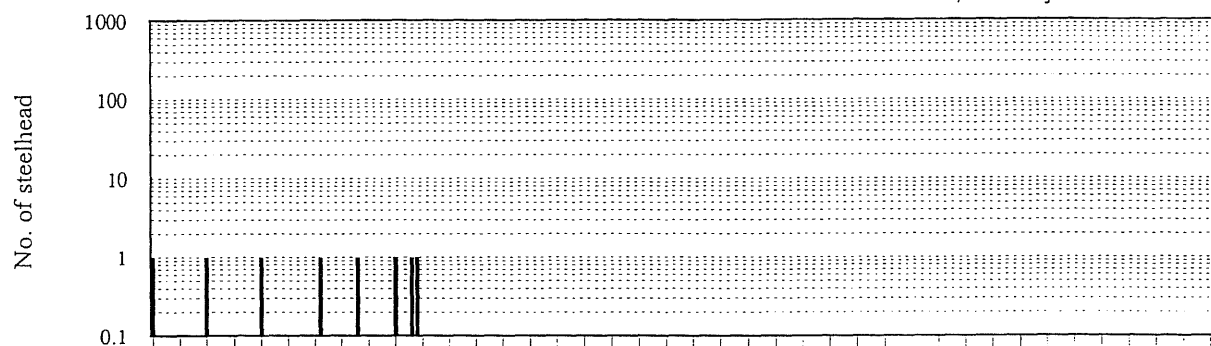
Week 22, 21-26 May 2000



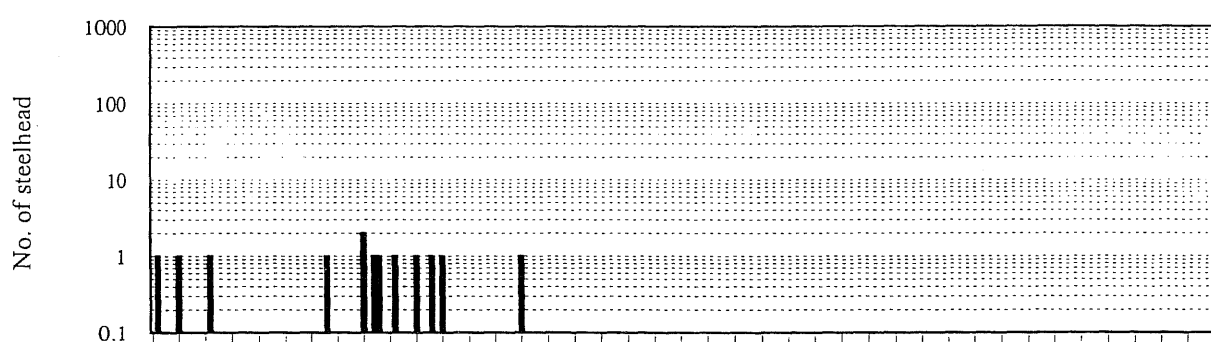
Size -- FL in mm

Steelhead size distribution Upper Sacramento River rotary screw trap

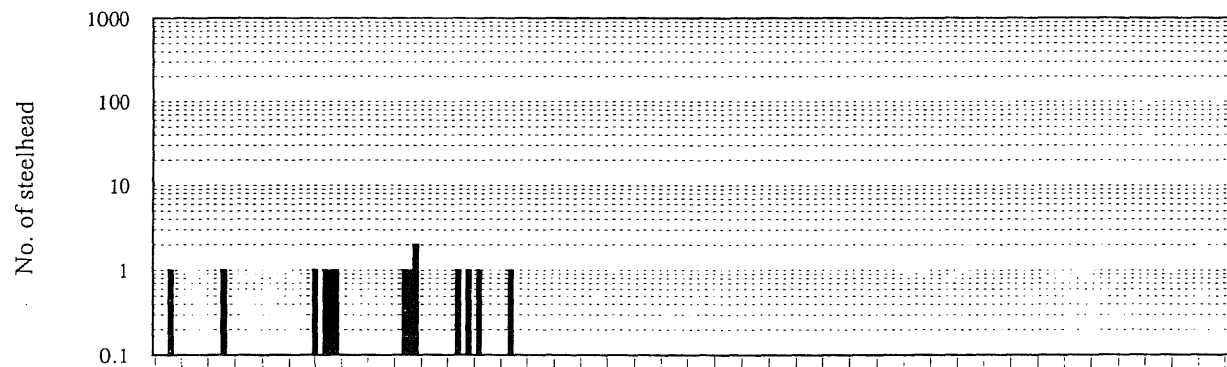
Week 23, 28 May-3 Jun 2000



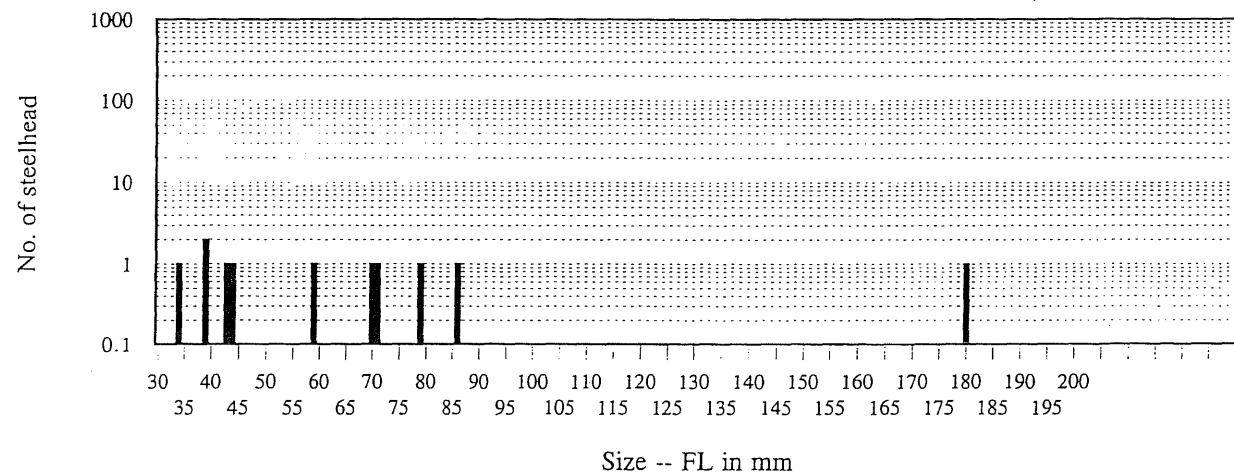
Week 24, 4-10 Jun 2000



Week 25, 11-17 Jun 2000

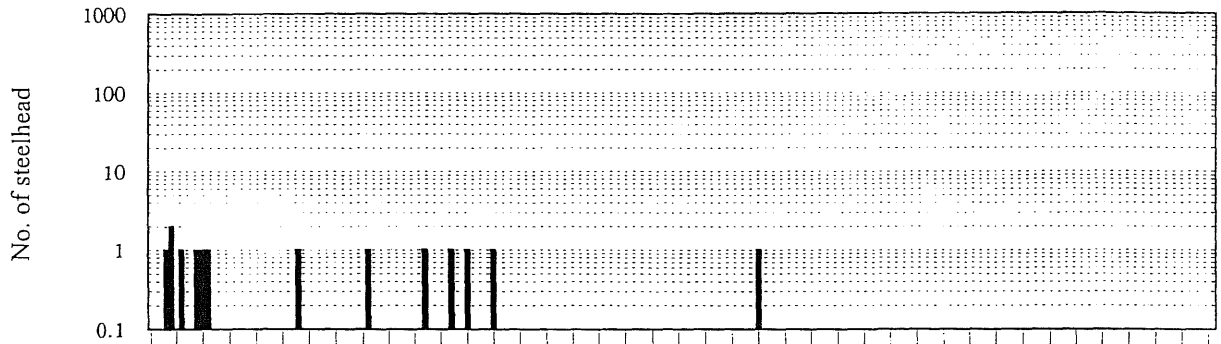


Week 26, 18-24 Jun 2000

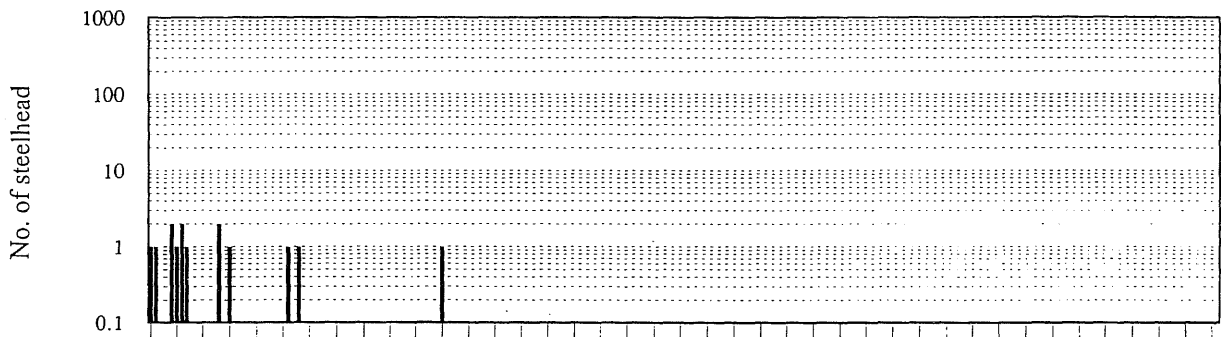


Steelhead size distribution Upper Sacramento River rotary screw trap

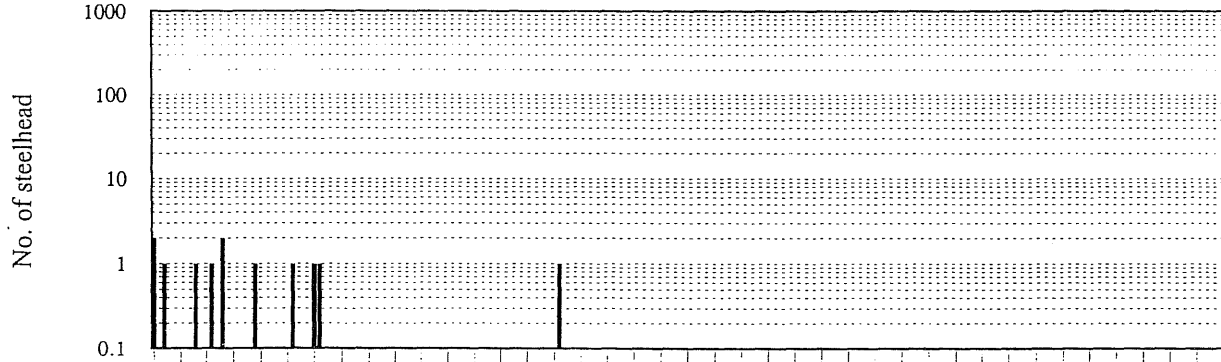
Week 27, 25 Jun-1 Jul 2000



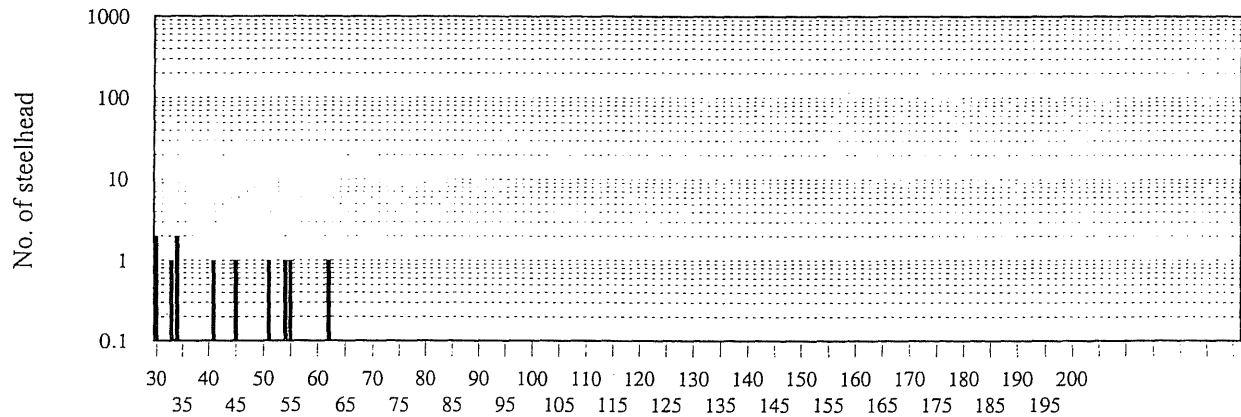
Week 28, 2-8 Jul 2000



Week 29, 9-15 Jul 2000



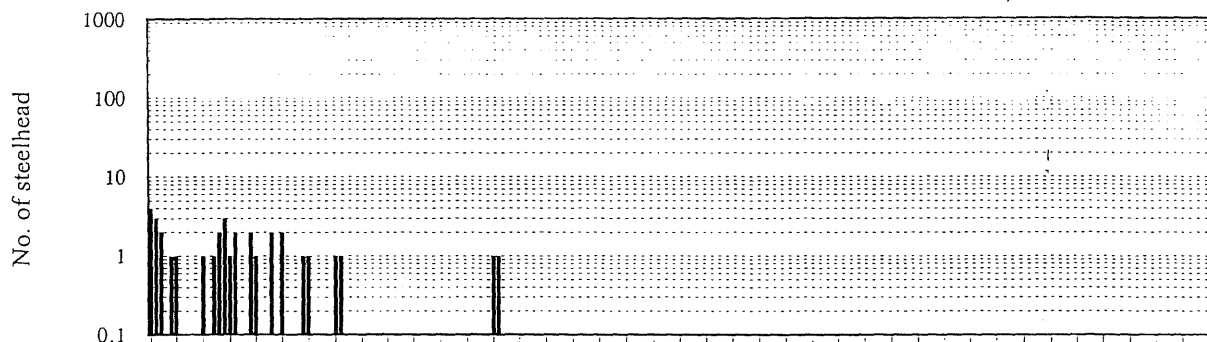
Week 30, 16-22 Jul 2000



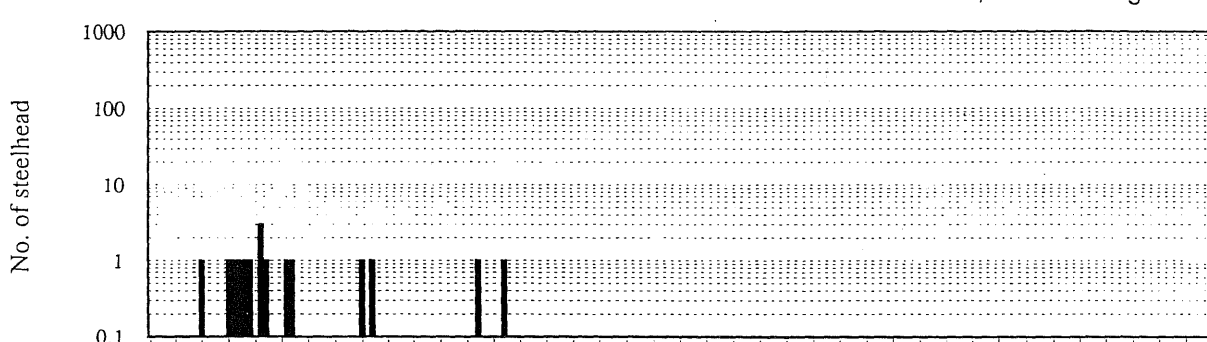
Size -- FL in mm

Steelhead size distribution Upper Sacramento River rotary screw trap

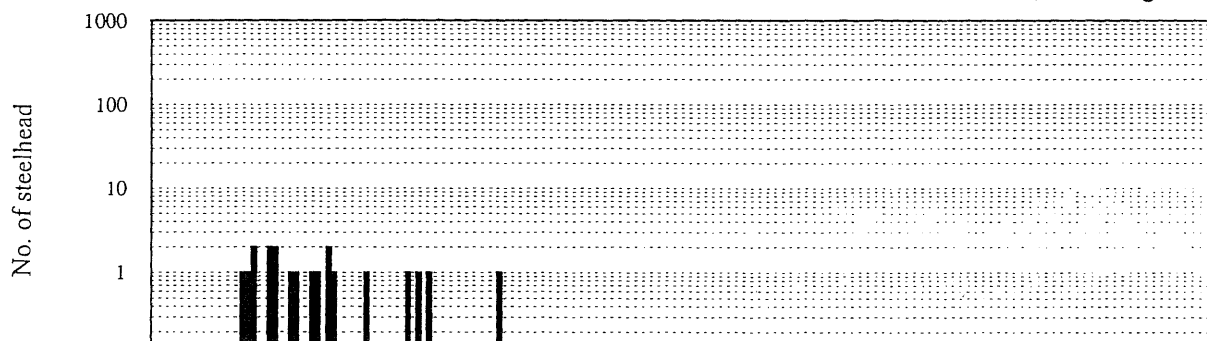
Week 31, 23-29 Jul 2000



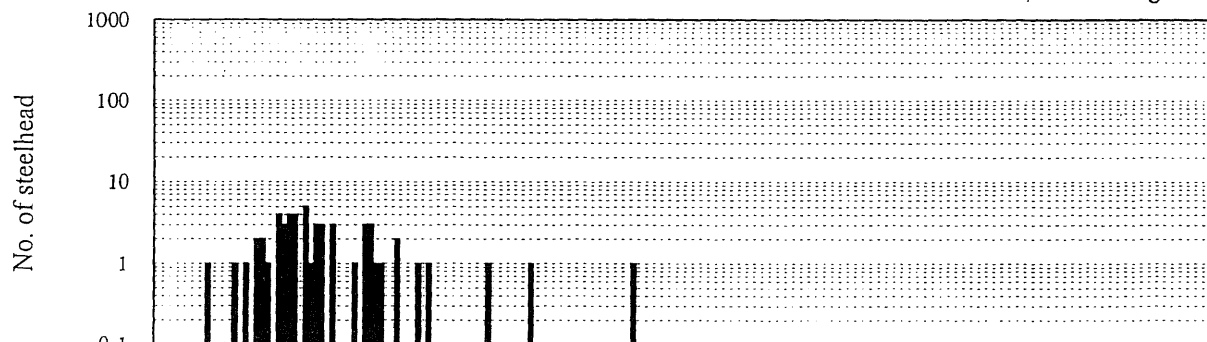
Week 32, 30 Jul-5 Aug 2000



Week 33, 6-12 Aug 2000



Week 34, 13-19 Aug 2000

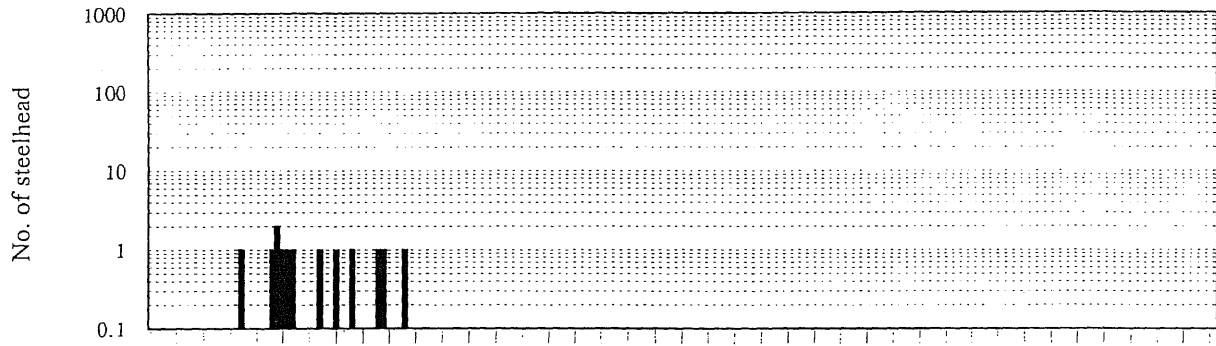


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35 45 55 65 75 85 95 105 115 125 135 145 155 165 175 185 195

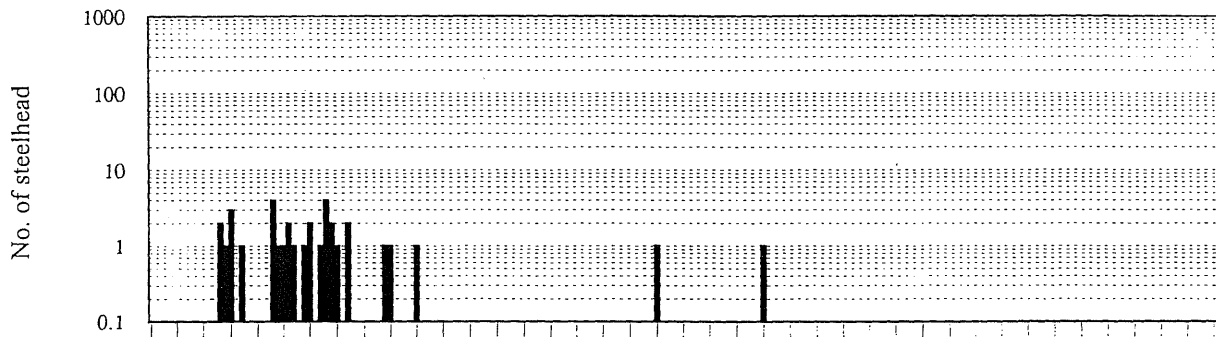
Size -- FL in mm

Steelhead size distribution Upper Sacramento River rotary screw trap

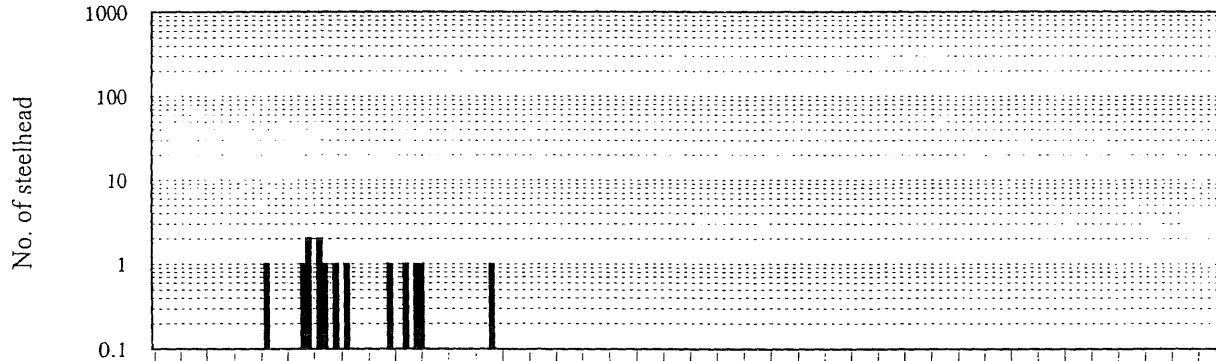
Week 35, 20-26 Aug 2000



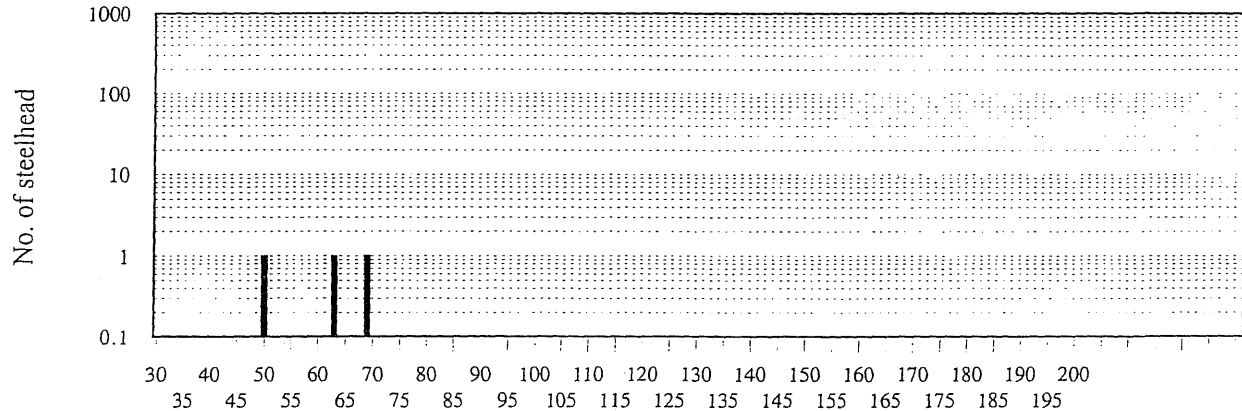
Week 36, 27 Aug-2 Sep 2000



Week 38, 10-16 Sep 2000



Week 39, 17-23 Sep 2000



Size -- FL in mm

Steelhead size distribution Upper Sacramento River rotary screw trap

Week 40, 24-30 Sep 2000

